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STRATEGY FOR DEVELOPMENT OF AN EXPEDIENT FACILITIES
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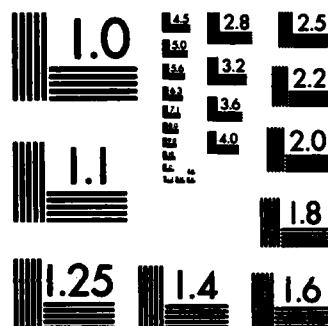
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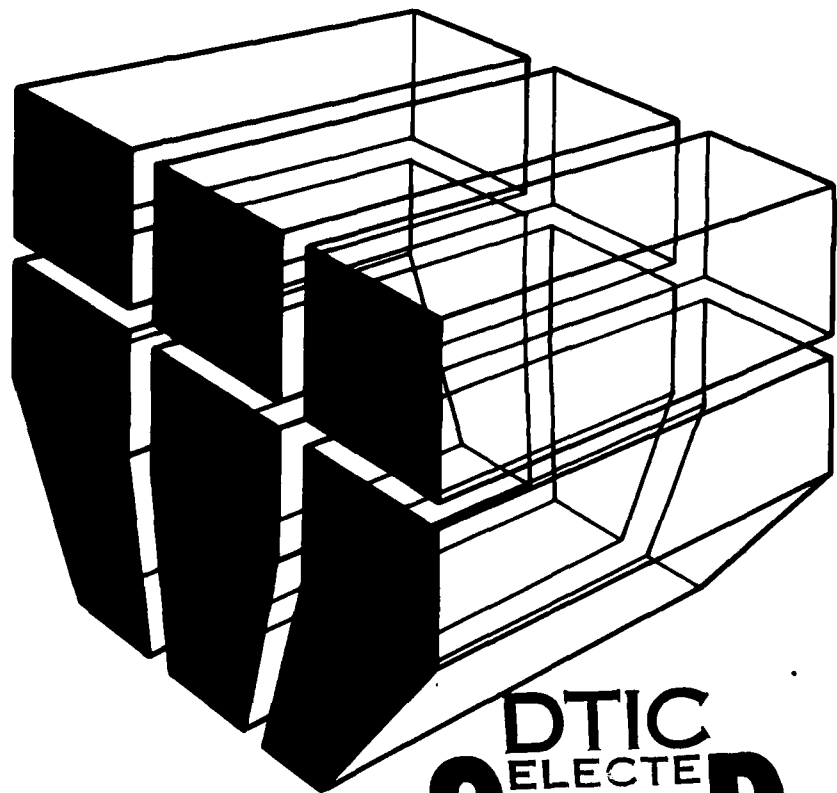
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CEERL

Technical Report P-150
December 1983

**STRATEGY FOR DEVELOPMENT
OF AN EXPEDIENT FACILITIES CATALOG**

by
**R. L. Schneider
E. M. Goodale**



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Engineers (FE) during a mobilization. Such a catalog is intended to assist the DEH/FE in meeting critical facility requirements in the preliminary stages of mobilization.

The strategy for disseminating information on expedient facilities is intended for both the Corps of Engineers Direct Support District and the installation DEH/FE. The strategy will allow for the identification of locally available facility resources which may be used as (1) an alternative to the acquisition of facilities by conventional means; and (2) a contingency for meeting unexpected mobilization facility requirements. It focuses on manufactured products which are available primarily off-the-shelf, which meet or accommodate facility requirements with no or minor modifications, and which are capable of delivery, erection, and occupancy within 30 to 60 days of mobilization.

Information is provided on product/system characteristics and capabilities, points of contact for procurement and technical assistance, and guidance on product/system application. A sampling of products/systems is identified to address facility requirements for housing, dining, latrine/shower, vehicle maintenance, warehouse/storehouse, medical and site utilities.

Field testing of the prototype Expedient Facilities Catalog at Fort Benning and Fort Jackson confirmed the need for the types of data presented; however, test results also indicated it would be more appropriate to condense the amount of information presented in the prototype and locate it in Installation Support Books instead of a special catalog.

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FOREWORD

This investigation was performed for the Directorate of Engineering and Construction, Office of the Chief of Engineers (OCE), under Project 4A162731AT41, "Military Facilities Engineering Technology"; Task Area F, "Theater of Operations Construction"; Work Unit 013, "Expedient Facilities Catalog."

This investigation was performed by the Facility Systems Division (FS), U.S. Army Construction Engineering Research Laboratory (CERL). CERL personnel directly involved in the study were Mr. Richard L. Schneider (Principal Investigator), Mr. Eddis M. Goodale, Mr. Sadi A. Assaf, Ms. Jennifer M. Kmetz, Ms. Patricia A. Gavino, and Ms. Theresa E. Mazelis.

Mr. E. A. Lotz is Chief of CERL-FS. COL Paul J. Theuer is Commander and Director of CERL, and Dr. L. R. Shaffer is Technical Director.

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STRATEGY FOR DEVELOPMENT OF AN EXPEDIENT FACILITIES CATALOG

1 INTRODUCTION

Background

The total amount of construction required to support the mobilization mission at both troop and production base installations has been placed at \$40 billion (calendar year 1980 dollars).¹ Mobilization projects are currently defined as follows: Group I--designed and constructed prior to mobilization Day (M-Day); Group II--designed prior to M-Day with construction to commence upon receipt of mobilization orders; and Group III--not to be programmed prior to M-Day, but defined in an installation's Mobilization Master Plan. By definition, most construction required for a mobilization effort is of the Group I type; this construction should be in place on M-Day. However, in considering today's depressed economy with limited labor and materials available, Group I, II, and III projects will most likely be constructed following M-Day. The magnitude of this construction effort would severely tax a healthy building construction industry. Any mobilization effort in an environment with limited labor and materials will have to use those resources even more effectively.

Army plans currently provide for the acquisition of all mobilization facilities by conventional design-bid-build practices. Many facility requirements will be met through reduction of the peacetime space use authorizations and through the use of current residual or excess space. However, the majority of the mobilization need will be met by new construction. Facility requirements are now being developed through preparation of Mobilization Master Plans at installations with a mobilization mission. Standard Army mobilization designs are also being prepared as are mobilization technical manuals. These designs identify the standard configurations for mobilization facilities and provide complete and variable construction details for the accommodation of local labor and materials. These designs will be used by the individual installation and/or the Corps of Engineers (CE) Direct Support District in the preparation of construction packages for all Group I and II mobilization projects identified in the Mobilization Master Plan.

Additional information and guidance will be provided in the Army technical manuals on emergency construction.² These mobilization designs and manuals (M-drawings and manuals) are essentially an update of previous emergency drawings and manuals (E-drawings and manuals) prepared during the late 1950s and early 1960s. The updates will incorporate current building technologies and functional changes to reflect revised criteria. The facilities identified in the drawings and manuals typically are one- or two-story wood frame.

¹ G. W. Greco, et al., Corps Mobilization Capabilities, Requirements, and Planning (U.S. Army Engineer Studies Center, March 1980).

² TM 5-880-1, TM 5-880-2, TM 5-880-3, TM 882-1, TM 5-822-2, TM 5-822-3, TM 5-822-4, TM 5-822-5, TM 5-884-1, TM 5-884-2, TM 5-884-4, TM 5-890-3 (for complete bibliographic information, see Appendix C).

facilities. These structures use the most abundant construction materials and the most widely used construction techniques such as the conventional or stick-built approaches. Some facility types (such as vehicle maintenance, warehousing, and assembly buildings) are designed to use pre-engineered metal building systems as well as wood systems. Installation support books are being prepared to contain information on local resources. These books will identify construction contractors and their capabilities; local sources for all types of construction materials, supplies, and equipment; and local facilities that may be used on a temporary basis to meet facility requirements in the early stages of a mobilization.

Alternative technologies also exist or are in development to provide military installation personnel with the capability to produce their own "expedient facilities" as needs arise. These range from fairly conventional lightweight wood structural systems, ribbed and arched metal systems, through tension- and air-supported fabric structures, to more exotic systems.* The emphasis has been on the provision of equipment to produce/erect the appropriate systems and the stockpiling of appropriate materials at mobilization sites.

Objective

The objective of this study was to develop and evaluate a strategy for identifying and disseminating information on manufactured facility and utility products or systems that are rapidly erectable and available locally off-the-shelf for use by CE Direct Support District personnel and DEH/FE personnel at installations in meeting mobilization facility requirements.

Approach

The objective was achieved using the following approach:

1. The mobilization mission, stationing requirements, and construction programs of installations were evaluated; installations were then ranked on the basis of mobilization requirements. Demonstration installations were selected in accordance with established rankings for a single CE Direct Support District.
2. Mobilization construction programs were evaluated and facility types were ranked on the basis of need. High priority facility types were selected as applicable, and current design criteria and standard designs were evaluated.
3. A search was conducted for manufacturers of products and systems capable of providing facility/utility systems for defined facility types to selected demonstration installations.

* CERL has developed a system for polyurethane foam dome construction for mobilization applications. Information on this technology is presented in Appendix A.

4. Manufacturers of products/syems meeting minimum established criteria were surveyed to obtain information on their products/systems characteristics and capabilities.

5. Applicable products/systems were evaluated and ranked on the basis of criteria derived from regulatory documentation. Highest ranking products/systems were "preselected" for inclusion in the catalog.

6. Product/system data were prepared in catalog format.

7. The prototype Expedient Facilities Catalog was field tested during FY83 mobilization exercises at Fort Benning, Fort Jackson, and the Savannah District, Corps of Engineers. Field feedback was gathered and final recommendations formulated.

Mode of Technology Transfer

Implementation of this report's recommendations requires an addition to the CE Mobilization and Operations Planning System (CEMOPS).³ This addition to "Appendix G, Military Programs, Section I, Installation Support Book," should require ISBs to include data on pre-engineered or prefabricated facilities as identified in Chapter 4 of this report.

³ Mobilization and Operations Planning System (CEMOPS) (U.S. Army Corps of Engineers, February 1982 [DRAFT]).

2 METHODOLOGY

Emergency Mobilization Planning and Process Review

At the start of this study it was assumed that a wide variety of off-the-shelf building facility technologies were available in the event of an emergency mobilization. The mobilization process as discussed in various Office of the Chief of Engineers (OCE) reports and evidenced in the latest CE Mobilization Plan (CEMP) was reviewed and the roles of the players evaluated.⁴ Work being sponsored by OCE to develop mobilization standard facility designs and technical manuals as well as the development of Mobilization Master Plans at installations was also monitored.

The primary users were determined to be the CE Direct Support District and the mobilization installation's DEH/FE. The Districts are primarily responsible for the execution of the mobilization construction requirements; the DEH/FE are eventual users of the facilities. The catalog would provide the DEH/FE a means of procuring facilities in the event that mobilization activities required additional facilities. (The actual field testing indicated the prime user to be the appropriate CE Direct Support District.)

Selection of Mobilization Installation(s)/Direct Support District

Two Army mobilization installations, Forts Benning and Jackson, and their CE Direct Support District in Savannah, GA, were selected to demonstrate the usefulness of a prototype Expedient Facilities Catalog. Their selection was based on ranking the installations by the magnitude of their mobilization construction requirements. These requirements were determined through an evaluation of currently planned mobilization projects and the latest mobilization stationing plans. An emphasis was placed on those installations with high stationing increases and/or construction requirements early in the mobilization. Consideration was also given to the problem of availability of producers of manufactured products/systems. However, the mobilization installations ranked highest by the above criteria were by coincidence in a region of the highest density of manufactured products/systems. Table 1 lists all mobilization installations considered in the selection process. The location of each installation is shown on the map in Figure 1.

⁴ G. F. Greco, et al., Corps Mobilization Capabilities, Requirements, and Planning; G. F. Greco, E. Rapp, and J. Tate, Corps Mobilization Posture (USACE, February 1980); J. Tate, Mobilization Environments (USACE, November 1979); J. Tate, USACE Mobilization Posture Update 1981 (USACE, May 1981); J. Tate, L. Lang, L. Wright, and P. J. Slatlery, USACE Work Force Requirements for Mobilization, Report Number R-18-13 (USACE, October 1981); and Corps of Engineers Mobilization Plan (CEMP) (USACE, August 1981).

Table 1

Mobilization Installations

<u>Installation</u>	<u>Location</u>	<u>MACOM</u>
1 Aberdeen Proving Ground	Maryland	DARCOM
2 Camp Atterbury	Indiana	TRADOC
3 Fort Belvoir	Virginia	TRADOC
4 Fort Benning	Georgia	TRADOC
5 Camp Blanding	Florida	(1)
6 Fort Bliss	Texas	TRADOC
7 Fort Bragg	North Carolina	FORSCOM
8 Fort Buchanan (2)	Puerto Rico	FORSCOM
9 Fort Campbell	Kentucky	FORSCOM
10 Fort Carson	Colorado	FORSCOM
11 Fort Chaffee	Arkansas	TRADOC
12 Fort Devens	Massachusetts	FORSCOM
13 Fort Dix	New Jersey	TRADOC
14 Fort Drum	New York	FORSCOM
15 Camp Edwards	Massachusetts	(1)
16 Fort Eustis	Virginia	TRADOC
17 Fitzsimmons Army Medical Center	Colorado	HSC
18 Fort Gordon	Georgia	TRADOC
19 Gowen Field	Idaho	(1)
20 Camp Grayling	Michigan	(1)
21 Fort Benjamin Harrison	Indiana	TRADOC
22 Fort A. P. Hill	Virginia	TRADOC
23 Fort Hood	Texas	FORSCOM
24 Fort Sam Houston	Texas	FORSCOM
25 Fort Huachuca	Arizona	USACC
26 Indiantown Gap	Pennsylvania	FORSCOM
27 Fort Irwin	California	FORSCOM
28 Fort Jackson	South Carolina	TRADOC
29 Fort Knox	Kentucky	TRADOC
30 Fort Lee	Virginia	TRADOC
31 Fort Lewis	Washington	FORSCOM
32 Fort McClellan	Alabama	TRADOC
33 Fort McCoy	Wisconsin	FORSCOM
34 Fort Meade	Maryland	FORSCOM
35 Fort Monmouth	New Jersey	DARCOM
36 Fort Ord	California	FORSCOM
37 Fort Pickett	Virginia	TRADOC
38 Fort Polk	Louisiana	FORSCOM
39 Presidio of San Francisco	California	FORSCOM
40 Redstone Arsenal	Alabama	DARCOM
41 Fort Richardson (2)	Alaska	FORSCOM
42 Fort Riley	Kansas	FORSCOM
43 Camp Ripley	Minnesota	(1)
44 Fort Rucker	Alabama	TRADOC
45 Camp Roberts	California	FORSCOM
46 Fort Shafter/ Schofield Barracks (2)	Hawaii	WESTCOM
47 Fort Sheridan	Illinois	FORSCOM
48 Fort Sill	Oklahoma	TRADOC
49 Camp Shelby	Mississippi	(1)
50 Fort Stewart	Georgia	FORSCOM
51 Fort Story	Virginia	TRADOC
52 Tobyhanna Army Depot	Pennsylvania	DARCOM
53 Fort Leonard Wood	Missouri	TRADOC

(1) Installations owned and operated by the State to be used by the Army in mobilization.

(2) OCONUS installations (all others are CONUS installations).

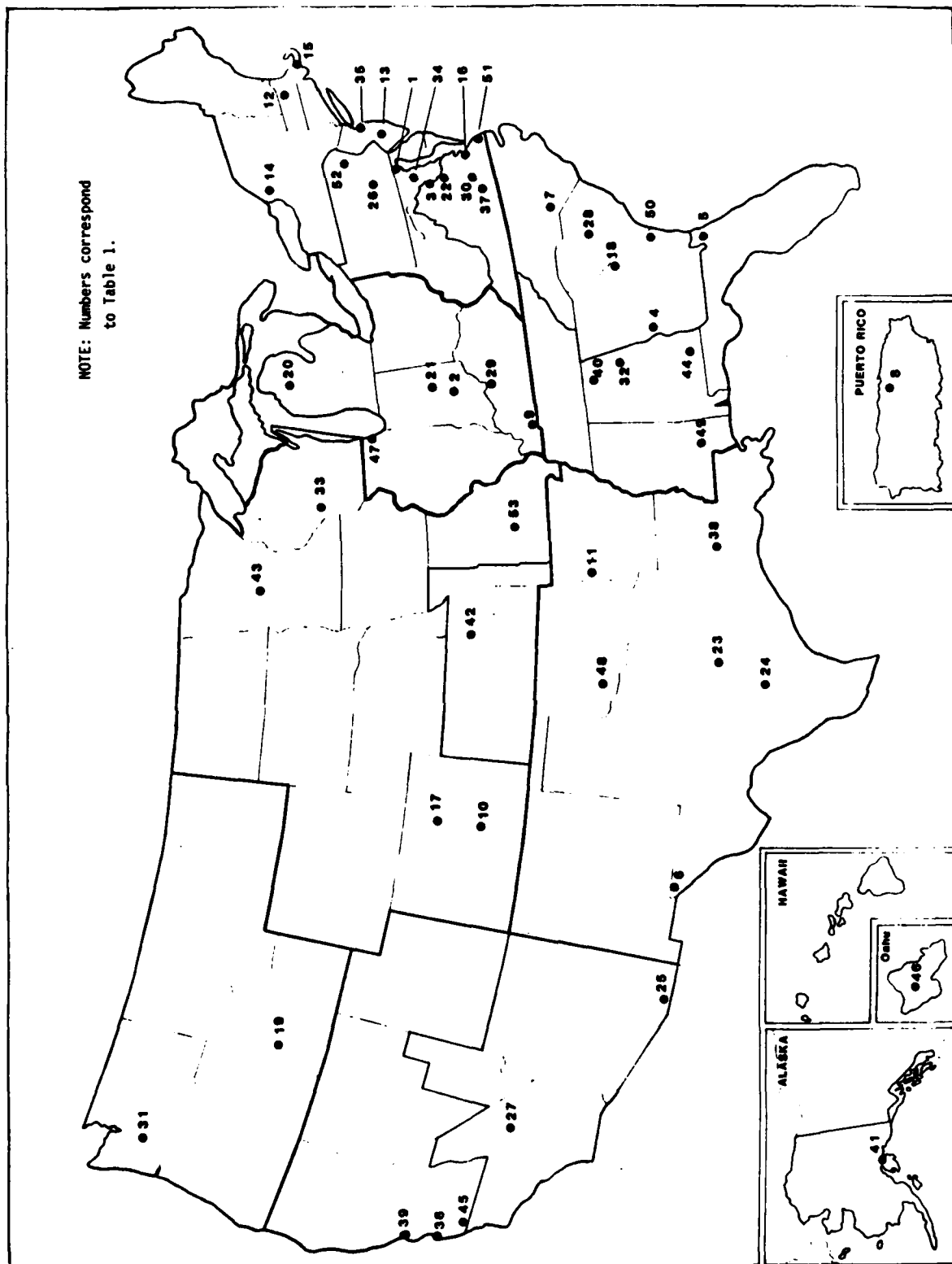


Figure 1. Mobilization installations.

Selection of Applicable Facility Types

The OCE Project Tracking System Mobilization Program Project List was reviewed to determine what types of facilities should be addressed in the catalog and their priority in the program. This listing contains projects grouped by mobilization installation and provides information including facility category code, project description (short project title), the Mobilization Group (I, II, or III), the current scope, and the required occupancy date relative to M-day.

The project short titles and facility category codes were reviewed and projects which were candidates for construction using off-the-shelf facility/utility systems were identified. This was done by comparing Army facilities with buildings currently produced by industry for the private sector. Essentially all Army facility category codes, as described in AR 415-28, with (generic) functional requirements similar to those currently produced for the private sector were selected.⁵

Mobilization project scopes for selected facility types were reviewed; priority was established on the basis of the total magnitude of construction required by broadscope facility type.

The time phasing of the construction requirements was established by review of project mobilization groups and required occupancy dates. Projects in Mobilization Groups I and II with required occupancy dates on or before M-day or 60 days later were considered to be applicable and were grouped together. Highest priority was given to projects having the earliest required occupancy date.

The facility types selected were compared with preliminary copies of the mobilization drawings.* Those drawings similar to the selected facility types were listed. Table 2 shows the selected broad scope facility types, the 5-digit Army facility category codes, and the related Army mobilization standard design drawings.

Mobilization Facilities Criteria/Selection Assumptions

Mobilization facilities have until recently been planned, programmed and designed in accordance with AR 415-50, using a series of emergency standard designs and technical manuals for emergency construction.⁶ Both the emergency designs and drawings are out of date. As indicated earlier, new mobilization designs and drawings are being prepared by the Huntsville Division to reflect current building design and construction standards. OCE has distributed

⁵ AR 415-28, Construction, Department of the Army Facility Classes and Construction Categories (Department of the Army, November 1981).

⁶ AR 415-50, Basic Facility and Space Criteria for Construction at United States Installations in the Event of an Emergency (Department of the Army, July 1978).

* At the time of the study these drawings were being prepared on contract through Huntsville Division, Corps of Engineers, for OCE.

Table 2

Mobilization Project Facility Category Codes Amenable to Industrialized
Building and Related Mobilization Standard Designs
in Order of Program Priority

1. Housing—Unaccompanied Personnel Housing, Enlisted Personnel and Officers

Cat. Codes: 721 15 Enlisted Barracks, Mobilization
724 10 Unaccompanied Officers Quarters, Military

M-Drawings: Unaccompanied Housing for 288 Enlisted Personnel @ 54 SF/PN
Unaccompanied Housing for 288 Enlisted Personnel @ 72 SF/PN
Unaccompanied Housing for 176 Enlisted Personnel @ 54 SF/PN
Unaccompanied Housing for 176 Enlisted Personnel @ 72 SF/PN
Unaccompanied Housing—Officers Quarters, 40/44 Officers.

2. Dining—Enlisted Personnel or Officers

Cat. Codes: 722 10 Enlisted Personnel Dining Facility (Detached)
722 20 Officers Field Ration Dining Facility.

M-Drawings: Enlisted Personnel Dining Facility, 200 PN (Company Size)
Enlisted Personnel Dining Facility, 800 PN (Battalion Size)
Officers Field Ration Mess, 200 PN

3. Latrine/Shower

Cat. Codes: 723 24 Detached Latrine/Shower Building

M-Drawings: Detached Lavatory, 176 PN

4. Operational, Training and Administration

Cat. Codes: 141 82 Regimental/Brigade Headquarters Building
141 83 Battalion Headquarters Building
171 50 Battalion Classroom
171 51 Battalion Administration and Classroom
610 12 Division Headquarters Building
723 30 Administration and Supply (Company, UPH Detached Facilities)

M-Drawings: Brigade and Support Command Headquarters Building
Battalion Headquarters and Classroom
Battalion Classroom
Administration and Supply
Division Headquarters Building, Light or Heavy Division
Division Headquarters Building, Training Division
Headquarters Building for Division Artillery or Division Support Command

5. Vehicle Maintenance Warehouse and Storehouse

Cat. Codes: 214 10 Vehicle Maintenance Shop, Organizational
442 20 General Purpose Warehouse
442 70 General Storehouse

M-Drawings: Motor Repair Shop
Tank Repair Shop
Division Storehouse
Company/Battalion Combined Warehouse

Table 2 (Cont'd)

6. Medical Facilities--Dental Clinics and Dispensaries

Cat. Codes: 540 10 Dental Clinic
550 10 Clinic Without Beds

M-Drawings: Dental Clinic, 18 Chair
Dental Clinic, 38 Chair
Health Clinic, Consolidated

7. Site Utilities

Cat. Codes: 811 90 (Electric Power Source Other) Generators, Temporary Electrical
Generation
812 30 Exterior Lighting
812 40 Distribution Systems (Electrical)
824 10 Gas Pipe Line
832 10 Sanitary Sewer
841 21 Ground Storage Tank (Water)
842 10 Water Pipe Line, Potable

M-Drawings: None

Note: M-Drawings indicated are only those that correspond to selected IB amenable mobilization facility types.

interim-use criteria and standards for emergency/mobilization construction.⁷ OCE has directed that existing emergency designs could be used if modified to meet current standards. OCE identified the Army Facilities Component System (AFCS), National Guard and Army Reserve Annual Training Program Facilities, and other designs from the index of designs for military construction as alternative design sources.⁸ Regardless of their source, all designs are to be modified as necessary to meet austere construction standards for mobilization and to build facilities in the minimum amount of time.

The interim criteria primarily address space allowances for all mobilization facilities; however, they do provide general guidance as listed below regarding overall facility design:

1. Compliance with current fire and life-safety codes is required.
2. Air-conditioning will not be provided except in areas where required for functional or operational purposes.
3. Except for hospitals, compliance with design requirements for the physically handicapped will not be required.
4. Compliance with current energy conservation goals and objectives is not required; however, passive energy-conscious design considerations will be included to the maximum extent practicable.
5. Construction shall be temporary with a life expectancy of 5 years; however, medical facilities may be of semipermanent construction.
6. Construction will be by methods in which contractors will provide all fixed and portable equipment.

Facility designs will be governed more critically by the environment in which they are actually to be constructed. A recent report to OCE by E. I. Brown Company identified the products, systems, and materials appropriate for a set of standard designs for mobilization.⁹ The report identified conditions that would be encountered during mobilization, developed assumptions about the construction industry in a mobilization environment, and established design guidelines for mobilization structures. Alternative designs were then evaluated in terms of the above assumptions and guidelines, and proposals were developed for mobilization facility design configurations.

E. I. Brown's studies and other studies by the U.S. Army Engineer Studies Center are in agreement on factors that will affect construction in a

⁷ Interim Use Criteria and Standards for Emergency/Mobilization Construction on U.S. Army Installations in CONUS (DAEN-ECE-A, May 1982).

⁸ EP 1110-345-2, Index to Standard Designs (Department of the Army, January 1980).

⁹ E. I. Brown Company, Criteria Search, Preparation of Designs for Mobilization, Army (November 1981).

mobilization environment.¹⁰ Both energy and raw materials, especially those for which the U.S. is dependent on foreign sources, will be in short or restricted supply. Priority on the use of available critical, raw materials will be given to ammunition and weapons production over building construction. This will primarily impact on construction materials and equipment involving or using almost any metal. Disruption of the labor force will cause shortages which will vary with locale. The transportation of war materials will have priority over building materials and will limit the amount of fuel available for transporting construction materials. Stocks of produced goods and raw materials are currently low and not anticipated to increase soon considering the state of the economy. This will leave a small supply of materials with which to meet a short-term, high-volume need.

Construction in a mobilization environment will be extremely limited. Designs must use readily abundant materials which are currently in stock or capable of replenishment/manufacture in a short time. Designs must be as economical as possible and meet functional needs without exceeding the anticipated life that will be required. Facilities must be constructed using materials not required for the war effort; all nonessential items or equipment must be eliminated. Designs must consider universality of construction methods, speed of construction, and construction labor requirements. Timber has been identified as our most abundant available construction resource with second priority placed on concrete. Concrete is not excluded, but must be used for lower priority facilities due to high costs and length of construction time.

The same factors that govern the designs of conventional stick-built facilities will apply to factory prefabricated facility/utility systems, with minor exceptions. These factors are described below.

1. Completed Products on Hand--Manufacturers of facility/utility systems will often have an edge on conventional construction with regard to response or construction placement time due to an available inventory. Although this inventory will not be affected by labor or materials supply limitations, the placement of such materials may be affected by these factors.

2. Stock Construction Materials--Beyond the inventory of produced goods, both the conventional contractor and the manufacturer must rely on construction materials readily available. Local sources of supply will be available for a limited time before any noticeable shortages are felt. The manufacturer has an edge, however, in that most of them have enough materials in stock to continue production for 1 to 3 months. Local material and equipment suppliers may have their products diverted to essential production activities (this is within the power of the Federal Emergency Management Agency [FEMA]) thus affecting conventional construction activities. However, production of manufactured systems may continue uninterrupted for a longer period of time. This would mean a residual capacity to produce facilities, even including

¹⁰G. F. Greco, et al., Corps Mobilization Capabilities, Requirements, and Planning; G. F. Greco, E. Rapp, and J. Tate, Corps Mobilization Posture; J. Tate, Mobilization Environments; J. Tate, USACE Mobilization Posture Update 1981; J. Tate, L. Lang, L. Wright, and P. J. Slatlery, USACE Work Force Requirements for Mobilization; and Corps of Engineers Mobilization Plan (CEMP).

critical materials, for an extended period. Beyond this period, both the manufacturers of facility/utility systems and the conventional builder would be competing for the same limited supplies; therefore, the manufacturer would be forced to redesign products accordingly.

3. Unskilled Minimal Labor--Both construction methods will be affected by labor shortages. However, factory manufacturers require fewer skilled and total personnel to operate and will have an advantage over the conventional construction industry.

The selection of manufactured facility/utility systems for use in Army mobilization efforts ideally should be based on their ability to meet detailed Army criteria. This is the case with designs for mobilization facilities, since criteria can be predetermined and facilities designed and constructed accordingly. In a mobilization situation, the urgency of the situation may call for providing the most basic and expedient shelter possible for the function to be accommodated and leaving the users to adapt to the space provided.

Considering the minimal criteria available and/or required for constructing mobilization facilities and the fact that the ultimate task could quickly become one of providing basic shelter, manufactured building systems were determined to be applicable if the following two criteria were met:

1. As a minimum, the system produced must provide the basic building shell. This shell will include the exterior wall (with door/windows inclusive), roof (and weather surface), floor/ceiling, and structure.

2. The manufacturer must identify a capability to provide a product capable of meeting the functional requirements of one of the selected mobilization facility types.

Manufacturers would then be ranked on the evaluation of information obtained to determine how closely overall functional requirements and mobilization criteria were met.

Establishment of Catalog Data Format/Content

Review of mobilization criteria indicated that little information need be provided on detailed performance characteristics of the products/systems; instead, the focus should be on providing information on overall systems and their capabilities. In addition, complete information had to be provided concerning the points of contact for procurement and technical assistance. In anticipation of possible automation, facility characteristics/attributes that would establish an overall data format amenable to both manual and automated procedures were selected from a CERL computerized information system using the Remote Information Query System (RIQS). The total data determined to be required for the prototype catalog include a tabulation of products and their capabilities and actual manufacturer's catalog cuts. Selected facility attributes are listed in Table 3. Complete data listed by attribute are identified in Appendix B.

Table 3

Tabulated Manufacturer Product/System Data

Manufacturer Profile

Name/Address
 Product Name(s)
 Point of Contact
 Method(s) of Procurement
 Services Provided

Product/System Profile

Configuration
 Application Category Codes
 Code Compliance

Production CapacityProduct/System DataBasic System Elements Provided

Foundations
 Structure
 Basic Configuration
 Materials
 Exterior Walls
 Basic Configuration
 Exterior Finish
 Subsurface
 Core
 Interior Finish
 Windows
 Basic Configuration
 Materials
 Doors
 Basic Configuration
 Materials
 Frame

Basic System Elements Provided (Cont'd)

Roof
 Basic Configuration
 Exterior Surface
 Subsurface
 Floor
 Basic Configuration
 Finish Surface
 Ceiling
 Basic Configuration
 Materials/Finish
 Interior Partitions
 Basic Configuration
 Finish
 Subsurface
 Core
 Heating, Ventilating, and Air-Conditioning
 Location
 Control
 Energy Source
 Electrical Distribution
 Lighting
 Plumbing
 Basic Configuration
 Materials, Waste/Vent Pipe
 Materials, Water Distribution
 Materials, Gas Pipe
 Materials, Fixtures

Product/System Included/Excluded Interface

Basic Systems Elements Excluded
 Excluded Elements - Details
 Interface - Details

Comments from field testing indicated the above data were excessive in their description of system elements. An indication of material was considered nonessential.

Facility/Utility Systems Manufacturer Identification

A search area was defined as a 12-state region around the selected demonstration installations. This region included Alabama, Delaware, Florida, Georgia, Kentucky, Maryland, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia. This region was established based on manufacturer's typical shipping distances. In a mobilization situation, it would be advantageous to limit the shipping distances to minimize fuel consumption and highway usage. However, distances of 500 miles or more would still be acceptable in the procurement of systems for high priority facility systems and/or highly desired products. Competition for the same resources by nearby mobilization installations would preclude shipping over great distances except where installations are geographically distant.

Over 850 manufacturers of potentially applicable facility systems were identified using the sources in Table 4. This number was considered both unmanageable for the prototype catalog's phone survey and unnecessary for demonstration purposes. Therefore, a limit was set at 200 possible manufacturers. As a result of this limit, manufacturers typically within a 100- to 125-mile radius around each installation were contacted in Alabama, Georgia, North Carolina, and South Carolina.

No regional limits were placed on the identification of manufacturers of utility systems. Only 59 potentially applicable manufacturers were identified nationwide. This quantity, considerably limited due to the exclusion of conventional utility systems, was considered manageable and not further reduced.

Data Gathering Procedures

Telephone survey techniques were used to get all data required for the catalog (see Table 3 and Appendix B), but complete data were only obtained from a limited number of manufacturers. A two-part questionnaire was developed to obtain the data. The first part identified the manufacturer applicability and gathered data concerning overall product/system characteristics and capabilities; the second part obtained detailed product/system data.

Part I of the questionnaire (Table 5) was administered (at least in part) to 165 prospective manufacturers of facility systems. A modified version of Part I (see note, bottom of Table 5) was administered to 59 utility systems manufacturers. The applicability of a manufacturer's product/system to the catalog was determined at the outset of the interview. To be applicable, the product/system had to be usable for one of the defined mobilization facility types and had to be a "complete" system comprised of the basic building shell. If the product/system was not applicable, the interview was terminated.

Forty-four manufacturers of products/systems for building facilities were determined to be applicable and the entire Questionnaire Part II administered (Table 6). The complete information was displayed in matrix form. Table 7 demonstrates the format and type of entry information used in Fort Benning's capability matrix. The data were evaluated and the manufacturers ranked according to the following criteria: (1) percentage of total system provided, (2) degree of manufacturer involvement, (3) degree of fit, and (4) volume of supply.

Table 4

Sources of Manufacturers of Facility/Utility Products/Systems

Published Directories:

- Standard and Poor's Register (by Standard Industrial Code)
- Thomas Register
- VSM (Visual Search Microfile Files, Information Handling Services)
- *Telephone Book(s) Yellow Pages under the following headings:
 - Buildings, (all subcategories)
 - Dome Structures
 - Farm Buildings
 - Mobile Offices and Commercial Units
- Red Book of Housing Manufacturers, ISBN 0149-7642

Previous CERL Studies and Reports

- APCS Lightweight/Relocatable Structures, Manufacturers Surveyed, April 1981
- Child Care/Family Housing Systems Manufacturers, February 1980
- Computerized Industrialized Building Manufacturers Retrieval List, 1976
- Respondents to Industrialized Building Survey, August 1971
- Sample Systems, King Khalid Military City, 1976
- Miscellaneous In-House Industrialized Building Files

Trade Association Membership Directories

- *MBDA (Metal Building Dealers Association)
- MBMA (Metal Buildings Manufacturers Association), 1981
- NAHM (National Association of Home Manufacturers), 1981-82
- NPCA (National Precast Concrete Association), 1981-82
- PCI (Precast Concrete Instituted), 1982

Trade Publications Listings and Directories

- AIH/SBN (Automation in Housing and System Building News)
 - Buyers Guide, 1981
 - Components Manufacturers Directory, 1981
 - Top 100 (Housing Manufacturers), 1981
- Professional Building Manufactured Housing Directory, 1980
- MHN (Manufactured Housing Newsletter) Directory/Census of Manufactured Housing (To be published October 1983).

State Agency Listings

Most states have an agency or office devoted to the promotion of commercial or industrial development which maintains directories of manufacturers by Standard Industrial Code (SIC). Applicable SIC codes are 2452--Prefabricated Wood Buildings and Components, and 3448--Prefabricated Metal Buildings and Components. Contact the State Information Office to identify the appropriate agency(s).

- Chamber of Commerce
- Department of Industry and Trade
- Development Board
- Development Office
- Economic Development Office
- Office of Industrial Development

*In-House Source Lists

- CE District Procurement Office Bidders List
- Installation Procurement Office Bidders List

*denotes sources not used in development of the prototype Expedient Facilities Catalog.

Table 5
Questionnaire, Part I

1.	Complete Building System (to include Structure, Exterior Walls, Roof, and Floor/Ceiling)	Yes/No
*2.	System Description (enter on reverse)	
*3.	Firm/Manufacturing Plant--Name, Address, Phone Number	
*4.	Points of Contact for Procurement, Technical Information and Alternate/Local--Name, title, office/division/branch/etc., phone.	
5.	Activities in Which the Firm Engages:	
	Design of Complete Building System--	Yes/No
	Site Erection of Complete Building System--	Yes/No
	General Contracting--	Yes/No
	Sales of Complete Building System to Erector--	Yes/No
6.	Elements of System Provided (in addition to basic shell):	
	Foundation--	Yes/No
	Interior Partitions--	Yes/No
	Heating, Ventilating, and Air-Conditioning--	Yes/No
	Electrical Distribution--	Yes/No
	Lighting--	Yes/No
	Plumbing--	Yes/No
7.	Product Applicability to Army Facility Category Codes:	
	Housing--	Yes/No
	Dining--	Yes/No
	Latrine/Shower--	Yes/No
	Operational, Training, and Administration--	Yes/No
	Vehicle Maintenance, Warehouse, and Storehouse--	Yes/No
	Medical--	Yes/No
	Site Utilities--	Yes/No
8.	Prefabrication Configuration:	
	3-D Module--	Yes/No
	Panelized--	Yes/No
	Precut--	Yes/No
*9.	Production Capacities:	
	Average Monthly Production--	_____ SF
	Completed Product/System in Stock--	_____ SF
	Producible from Stock Materials--	_____ SF
	Deliverable Within Sixty (60) Days--	_____ SF
	Maximum Monthly Output--	_____ SF
**10.	Maximum Economic Shipping Distance	_____ mi.
**11.	Cost per square foot of enclosed floor area	_____ /SF
**12.	Standard size(s) or construction module size	_____ x _____
**13.	Methods of Procurement	
	Direct to Government	Yes/No
	Through Distributor/Dealer	Yes/No
	Through General/Prime Contractor	Yes/No
14.	Please send product information.	

*Items asked in telephone questionnaire administered to utility systems manufacturers.

**Suggested additions to questionnaire following prototype catalog fielding/feedback process.

Table 6

Questionnaire, Part II

For possible responses to the questions below, see Appendix B.

- | | |
|--|--|
| *1. Code Compliance | *9. Floor System |
| *2. Structure | * a. Basic Configuration |
| * a. Configuration | b. Finish Materials |
| * b. Materials | *10. Heating, Ventilating and Air-Conditioning |
| *3. Foundation Types (Provided/Required) | * a. Basic Configuration |
| *4. Exterior Walls | b. Energy Source |
| * a. Configuration | c. Location of Units |
| b. Exterior Finish | d. Control System |
| c. Subsurface Material | *11. Plumbing |
| d. Core Material | * a. Basic Configuration |
| e. Interior Finish | b. Waste and Vent Pipe Materials |
| *5. Windows | c. Hot Water Pipe Materials |
| * a. Configuration | d. Gas Pipe Material |
| b. Materials | e. Fixture(s) Material(s) |
| *6. Doors | *12. Ceiling System |
| * a. Configuration | * a. Basic Configuration |
| b. Materials | b. Finish Materials |
| c. Frame Materials | *13. Electrical Distribution |
| *7. Roofing System | *14. Lighting System--Basic Configuration |
| * a. Basic Configuration | *15. Interface Criteria |
| b. Structural Material | * a. Basic System Elements Excluded |
| c. Weather Surface Material | b. Excluded Elements--Details |
| *8. Interior Partitions | c. Interface--Details |
| * a. Basic Configuration | |
| b. Surface Finish | |
| c. Subsurface Material | |
| d. Core Material | |

*Indicates the topics suggested for coverage within a District-prepared catalog. All other sections are suggested for addition to a centrally prepared catalog.

Table 7

**Product/System Capabilities Matrix, Building Systems
Fort Benning**

	Services(1)				Facility Types (2)							Prefab Mode (3)			Major Mat (4)			Production Capacity (5) in 1000's of sq ft					Elements Provided (6)					
	1	2	3	4	1	2	3	4	5	6	7	1	2	3	1	2	3	4	5	1	2	3	4	5	6	7		
Adrian Housing Corp.	X	X	X	X	X	X	X	X	X			X			X			24	0	unk.	80	unk.	X	X	X	X	X	
All American of Ashburn	X	X	X	X	X	X	X	X	X			X			X			720	14	180	1440	1584	X	X	X	X	X	
American Building Co.	X			X	X	X	X	X	X			X			X			2000	3000	unk.	3000	4500	X	X				
Arabi Homes, Inc.	X	X	X	X	X	X	X	X	X			X			X			104	0	75	200	150	X	X	X	X	X	
Atlantic Building Systems, Inc.	X	X	X	X	X	X	X	X	X			X			X			600	0	10	1500	2000						
Butler Manufacturing Co.	X	X	X	X	X	X	X	X	X			X			X			1600	200	8000	3400	17600	X	X				
C.O. Smith Industries, Inc.	X	X			X	X	X	X	X			X			X			240	0	24	240	480	X	X	X	X	X	
Horton Homes	X	X	X	X	X	X	X	X	X			X			X			500	160	130	1000	unk.	X	X	X	X	X	
Lindy Homes				X		X	X	X	X			X			X			100	0	30	200	200	X	X				
Macon Prestressed Concrete Co.	X	X	X	X	X	X	X	X	X			X			X			250	0	250	500	unk.	X	X	X			
Madison Industries of Georgia	X	X	X	X	X	X	X	X	X			X			X			450	0	unk.	1000	1000	X	X	X	X	X	
Malone Homes, Inc.	X	X	X	X	X	X	X	X	X			X			X			125	unk.	250	250	175	X	X				
Miles Homes	X			X	X	X	X	X	X			X			X			68	0	170	340	340	X	X	X	X	X	
Mitchell Bros. Contractors, Inc.	X	X	X	X	X	X	X	X	X			X			X			30	0	20	70	120	X	X	X	X	X	
O.S.I., Inc.	X			X	X	X	X	X	X			X			X			1000	500	500	1000	2500	X	X				
Pascoe Steel Corp.	X			X	X	X	X	X	X			X			X			500	500	200	1000	700	X	X				

Table 7 (Cont'd)

	Services(1)				Facility Types (2)							Prefab Mode (3)			Major Mat (4)			Production Capacity (5) in 1000's of sq ft					Elements Provided (6)						
	1	2	3	4	1	2	3	4	5	6	7	1	2	3	1	2	3	1	2	3	4	5	1	2	3	4	5	6	7
Richards Lumber Co.	X	X			X			X	X			X			X			8.8	.0	3.3	17.6	26.4	X	X	X				
Robin Builders, Inc.	X	X			X	X	X	X	X			X			X			30	25	25	100	200	X	X	X	X	X	X	X
Ryan Homes, Inc.	X	X	X		X	X		X	X			X	X		X			60	unk.	unk.	110	unk.	X	X	X				
Star Manufacturing	X	X	X	X	X	X	X	X	X	X	X			X	X			400	5	unk.	800	800	X	X	X	X	X	X	X
Superior Portable Bldgs., Inc.	X	X			X	X	X	X	X			X			X			40	60	24	80	80	X	X	X	X	X	X	X
T & R Custom, Inc.	X				X	X	X	X	X	X	X	X			X			20	35	20	40	50	X	X	X	X	X	X	X
Trendsetter Building Systems	X	X	X	X	X	X	X	X	X	X	X	X			X			60	50	75	180	180	X	X	X	X	X	X	X
Vintage Homes, Inc.	X	X	X		X	X	X	X	X	X	X	X			X			120	4	30	240	120	X	X	X	X	X	X	X
Whitner Mobile Homes Products	X				X	X	X	X	X	X	X	X			X			14.4	15	3	30	33	X	X	X	X	X	X	X
SPECIALIZED SYSTEMS																													
Design Structures	X	X	X	X	X	X		X	X	X	X	X	X		X			30	0	80	70	110	X	X	X				
Envirovac	X		X								X	X			X			unk.	unk.	unk.	unk.	unk.							X
Marshall Erdman	X	X	X	X	X			X	X	X	X	X			X			unk.	0	unavailable			X	X	X	X	X	X	X
Porta-Kamp	X	X	X		X	X	X	X	X	X	X	X	X		X	X		995	0	unk.	1670	1670	X	X	X	X	X	X	X
Super Secur	X				X	X	X	X	X	X	X	X			X			9.6	0	14.4	19.2	19.2	X	X	X				

- (1) Services
- Design of Systems
 - General Contracting
 - Site Erection
 - Sales to Erector

- (2) Facility Types
- Housing
 - Dining
 - Lathrine/Shower
 - Operation, Training and Administration
 - Vehicle Maintenance/Warehouse
 - Medical
 - Site Utilities

- (3) Prefabrication Mode
- 3-Dimensional Model
 - Panelized
 - Precut/Pre-engineered

- (4) Major Material
- Wood
 - Metal
 - Concrete

- (5) Production Capacity
- Average Monthly
 - Inventory on Hand
 - Producible from Inventory
 - Deliverable w/in 60 Days
 - Maximum Monthly Output

- (6) Elements Provided (Structure, Exterior Wall, Roof, Floor are Assumed)
- Foundation
 - Ceiling
 - Interior Partitions
 - Heating, Ventilating and Air-Cond.
 - Electrical Distribution
 - Lighting
 - Plumbing

1. Percentage of Total System Provided. Products/systems were ranked by the percent of the total system that they provided based on a comparison of information in the "Elements Provided" column and the elements required for the specific facility type. Those manufacturers providing the most complete system and requiring the least additional construction were ranked the highest. Consideration was given to the fact that some product/system elements would not be required to satisfy mobilization facility requirements as determined through comparison to standard designs.

2. Degree of Manufacturer Involvement. Products/systems were ranked by the degree of manufacturer involvement based on an evaluation of services provided. Manufacturers providing the most services, the highest ranking combination of services, or the highest ranking services were ranked highest. Services provided were ranked in the following order: (a) general contracting, (b) site erection, (c) system design, and (d) sales to erector.

3. Degree of Fit. Products/systems were ranked based on how well they met functional requirements of the mobilization facilities. The requirements were defined in terms of the number and type(s) of spaces provided and overall configurations. The systems which most closely met the functional requirements were ranked highest. In general, the categories were: (a) system as produced provides all spaces required and is in a configuration similar to mobilization standard designs, (b) system can be configured to provide all spaces required and to meet mobilization standard designs, (c) system will accommodate requirements of mobilization facilities, and (d) system must be modified to accommodate requirements of mobilization facilities.

4. Volume of Supply. Products/systems were ranked on the basis of the quantity of product either deliverable within 60 days or the average monthly production, whichever was greater. The higher the volume, the better.

Manufacturers were selected only for demonstration purposes for the prototype catalog. A minimum of one manufacturer was selected for each facility type and for each type of product system. As an example for housing, a manufacturer was selected for the following system types: modular, panelized, and precut systems. The manufacturers who were selected had the highest ranking for their type of system. On this basis, 14 "local" manufacturers of products/systems were preselected for Fort Benning and Fort Jackson. An actual catalog would assign a predetermined cutoff in ranking manufacturers. This cutoff should be determined primarily by the manufacturer's capability to meet minimum established criteria, but secondarily to guarantee the quality of included products. Systems which exceed the minimum criteria would be considered to be preselected and ranked against all other preselected systems.

Twenty-one manufacturers of products/systems for site utilities were determined to be applicable through evaluation of data from Questionnaire, Part I. Detailed selection procedures were not developed or followed; however, applicability was determined on the basis of a manufacturer's ability to provide a total system or some system element capable of being used in an expedient fashion. Additional consideration was given to the distances from the installation to the manufacturer's plant facilities.

Five manufacturers of highly specialized and mobile facility systems were selected as applicable to both Fort Benning and Fort Jackson for use in the

demonstration. These manufacturers were not identified in regional listings nor limited by mileage considerations, but were included for their special characteristics.

Part II of the questionnaire (Table 6) was used to obtain the remaining data from the 14 preselected facility systems manufacturers. Part II of the questionnaire was not administered for utility systems manufacturers; Parts I and II were administered simultaneously for the specialized systems manufacturers.

3 RESULTS and ANALYSIS

The prototype catalog was sent for review to personnel at installations and at several CE offices with mobilization responsibilities. Using the feedback from the field, three options were developed for preparing an Expedient Facilities Catalog. These options are described in this chapter, in priority order. The order was selected by considering short-term funding limitations and long-term automation goals.

Prototype Catalog Field Test/Feedback

The prototype expedient facilities catalogs for Forts Benning and Jackson were fielded during FY83 Mobilization Exercises, MOBEX 83, Proud Saber. An outline of the prototype catalog for Fort Benning is provided as Table 8. Catalogs were presented to DEH/FE personnel at both installations in addition to the design and engineering staff at the Savannah District, Corps of Engineers. These presentations were oriented towards familiarizing personnel with the content and application of the catalogs as well as to obtaining valuable first-hand review comments. It was anticipated that if MOBEX 83 exercises called for facilities construction, selections could be made from cataloged products/systems. Unfortunately, no directives on facility construction were issued during the exercise and therefore no direct application of the catalog was made.

Additional copies of the Fort Benning prototype catalog were distributed to interested parties at Headquarters, U.S. Army Forces Command (FORSCOM); Headquarters, U.S. Army Training and Doctrine Command (TRADOC); and OCE. Additional copies of the Fort Benning prototype catalog were provided to the Fort Dix Directorate of Engineering and Housing (ATZ-DEH), Fort Riley Facility Engineer Office (AFZN-FE), and the Air Force Engineering and Services Center (USAFESC). The Charleston District, Corps of Engineers, responsible for direct support to Fort Jackson, was provided a copy of the Fort Jackson prototype catalog at its request.

Feedback from meetings at demonstration installations and districts during MOBEX 83 and from written and telephone contacts with other catalog recipients was categorized according to (1) technical content, (2) information organization, (3) manufacturer selection, (4) basic assumptions, and 5) field options. The field comments are summarized as follows:

1. Technical Content. Type and quality of technical data included or excluded. Reviewers in the most part were satisfied with the information provided and considered it to be excessive as opposed to insufficient. Of prime importance is supplier identification, and contact and capabilities information on both product provided and production capacities. Reviewers suggested that additional information on cost of the product/system and dimensional capabilities/coordination be included.

2. Information Organization. Data presentation methods. Catalog organization was considered overall to be comprehensive although confusing at first. More instruction on the use of the catalog was suggested as was the use of standard building construction coding systems.

Table 8

Prototype Expedient Facilities Catalog
Fort Benning

TABLE OF CONTENTS

INTRODUCTION

Background
Catalog Users Guide
User References

Section I: GUIDANCE BY FACILITY CATEGORY CODE

Housing
Dining
Latrine/Shower
Operational, Training, and Administration
Vehicle Maintenance, Warehouse, and Storehouse
Medical
Site Utilities

Section II: PRODUCT/SYSTEM DATA

(This section contains tabular data and product brochure excerpts for 12 manufacturers [21 systems] targeted for use by Fort Benning personnel.)

Section III: PRODUCT/SYSTEM CAPABILITIES MATRIX

Building Systems
Utility Systems

Section IV: PRODUCT/SYSTEM MANUFACTURERS

Expedient Facility Product/System Manufacturers
Manufacturers Regional Listing, Prospective
Manufacturers Disposition Matrix

Section V: NEW TECHNOLOGIES

3. Manufacturer Selection Process. The prototype catalogs included detailed information only on preselected manufacturers of facility types for use in the mobilization program of the specific installation. It was suggested that the catalog should include more information on all applicable manufacturers of all amenable category codes regardless of the defined mobilization program. This would enable installation personnel to locate suppliers of products/systems to meet unforeseen requirements. Additional comments criticized preselection priorities; however, as the preselection process was considered invalid, these comments are not identified. Some reviewers questioned the lack of generic and some specific systems in the catalog as prepared.

4. Basic Assumptions. The validity of the catalog as a concept to support mobilization facilities acquisition was questioned. Current Mobilization Troop Base Stationing Plans (MTBSP) indicate high early stationing peaks with correspondingly high immediate facility requirements. The catalog would greatly assist installation personnel in meeting these requirements for facilities acquisition. However, the MTBSP scenarios are now being questioned. More realistic scenarios are under consideration which extend stationing increases and lessen gross peaks in facility requirements. The facility requirements in these new scenarios are amenable to the longer delivery schedules associated with conventional procurement practices.

The catalog, although written to aid the DEH/FE by providing alternatives to conventional procurement, would in reality be unused by the DEH/FE. These individuals would be limited during mobilization by manpower and dollar funding ceiling limitations; therefore, most of the support actions would be deferred to the appropriate CE Support District.

It was also suggested that the catalog be designed for use on specified projects. These projects could involve the construction of certain high priority facilities defined by specific projects or types of facilities, or involve all facilities required within a specified time, such as within 45 days after mobilization.

5. Fielding Options. The expense, difficulty, and extensive procedures required to prepare a published catalog became apparent during the development and review of the prototype catalog. Questions were raised concerning who will prepare it, how it will be prepared, what it will cost, how accurate it will be and how often it will be updated. The simplest solution suggested for resolving these concerns was to include selected information in existing Installation Support Books. Any hard-copy catalog would eventually become useless if not updated annually or even semiannually. Other suggested alternatives, short of publication of hard-copy catalogs, included microfilm systems similar to the Visual Search Microfilm Files System (VSMF) or the preparation of a central interactive automated data base.

Option 1: Incorporation of Data in Installation Support Books

Overview

Each Installation Support Book (ISB) must include, as directed by the CEMOPS, a listing of construction resources in the immediate area of the

installation. This listing should include information on both the manufacturers/suppliers and the manufactured building systems they provide. Manufacturer data should be presented in the ISB in two basic formats--a capabilities matrix and tabular data.

This scenario for providing data on expedient facilities would probably entail the smallest outlay of funding and as such represents the most immediately practical fielding concept. The suggested order of data for the ISB is provided in Figure 2.

The steps involved in the Option 1 activity of incorporating data into ISBs are listed below and then described in greater detail.

Data Collection

1. Define Area of Search
2. Select Manufacturer Source Information
- 2a. Advertise for Interested Manufacturers
3. Obtain Manufacturer POC Information
4. Verify Manufacturer Applicability
5. Administer Questionnaire
- 5a. Request Product Brochures

Data Presentation

1. Prepare Capabilities Matrix
2. Prepare Manufacturer's List/Data

Data Collection

1. Define Area of Search. An area of contribution must be established at the outset of data acquisition within which all resources defined will be assigned to a specific CE Support District and installation. At first this assignment will be solely on the basis of location relative to a given installation; however, actual allocation may be adjusted once facility requirements are defined and need for a particular resource determined.

All resources of manufactured building systems are assigned to a given installation on the basis of the manufacturing source of that system being the closest to a given installation. Figure 3 represents the areas within which resources should be tentatively assigned to a specific installation. Resources which lie in boundary areas may be assigned to more than one installation at the discretion of the Support District. Actual use of a resource during mobilization may be assigned to a different installation on the basis of need. The Support District must coordinate resource allocation whether between installations under its control or across District boundaries.

2. Select Manufacturer Source Information. Table 4 lists the best sources of information from which to compile a list of manufacturers of buildings systems. Select resources applicable to the defined area of search.

2a. Advertise for Interested Manufacturers. In addition to identifying applicable manufacturers from source lists (Step 2), it is suggested to

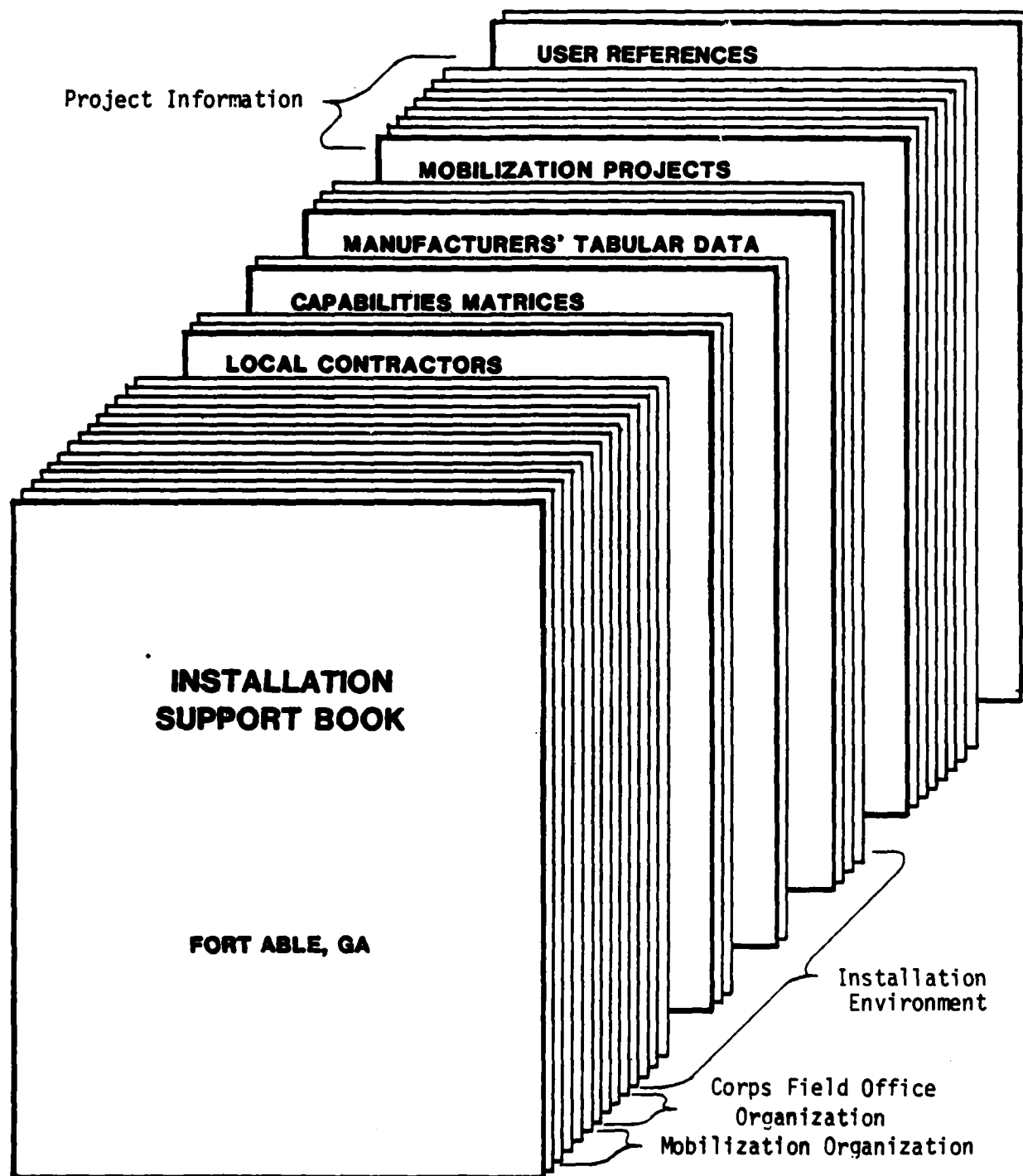


Figure 2. Data sequence: Installation Support Book.

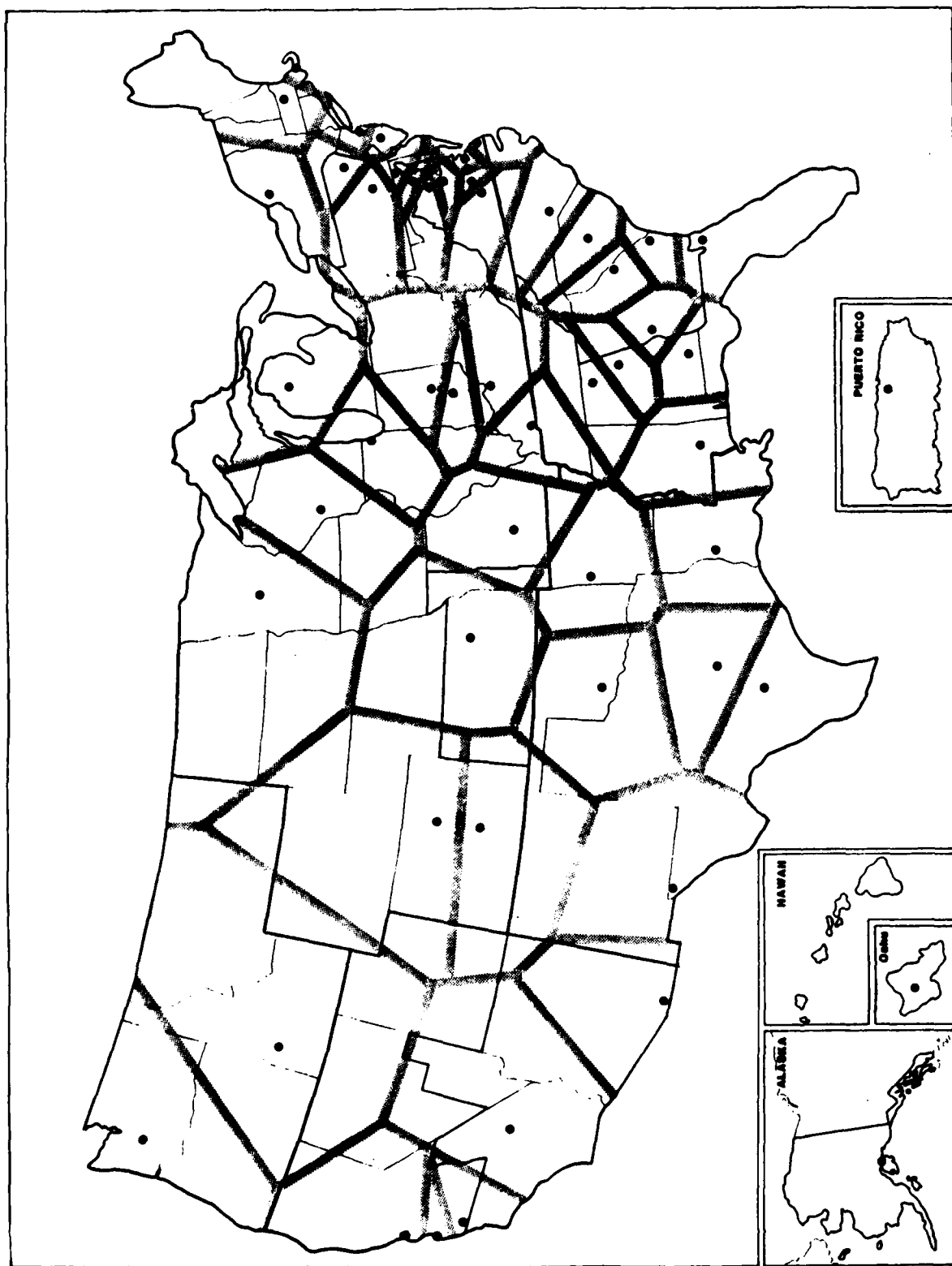


Figure 3. Proposed search area allocations.

advertise for interested manufacturers through the Commerce Business Daily (CBD) and other applicable trade journals. The advertisement should ask for point of contact (POC) data (Step 3 below) on manufacturers meeting minimum criteria (Step 4 below). Followup contact is recommended (Step 4 below) to verify information provided in response to the advertisement. Advertisements should not be used as the sole means of obtaining manufacturers.

3. Obtain Manufacturer POC Information. List from selected sources manufacturers and point of contact information in questionnaire format (Step 5 below). Some questionnaire elements required will be initially available from identified information sources.

4. Verify Manufacturer Applicability. Contact the manufacturer to confirm the accuracy of the source information obtained and determine the applicability of the manufacturer's product/systems. A brief explanation of the purpose of the catalog should be provided to the manufacturer, as should the following requirements for a manufactured product/system:

a. Manufacturer provides as a minimum the basic building shell to include exterior wall (with door/windows inclusive), roof (and weather surface), floor/ceiling, and structure.

b. Manufacturer identifies the capability to provide a product which meets the functional requirements of one of the mobilization facility types as listed in Table 2.

Identify the person with whom contact may be maintained during the course of data gathering.

5. Administer Questionnaire. Obtain data from applicable manufacturers by direct mail questionnaire. The questionnaire (Tables 5 and 6) may be modified to answer additional CE Support District requirements. Followup telephone contact may be required to verify questionnaire responses.

5a. Request Product Brochures. The data requested in the questionnaire (Table 5) are all that were determined necessary for ISB inclusion. During telephone contacts (Step 4) or the administration of the questionnaire (Step 5), it is recommended that additional manufacturer product literature/catalogs be requested. These data will be useful in continuing contact with the manufacturer and may be cataloged or filed separately in CE district determined format.

Data Presentation

Manufacturer data should be presented in the ISB in two basic formats--in matrix format for ease in determining overall capabilities, and tabular format for complete information on the POC and the product/system offered.

1. Prepare Capabilities Matrix. Present capabilities data in matrix format as indicated in Figure 4.

2. Prepare POC/Miscellaneous Data. Present POC data and additional miscellaneous manufacturer data in tabular format as indicated in Table 9. This information should be listed in alphabetical order by manufacturer.

PRODUCT/SYSTEM CAPABILITIES MATRIX

BUILDING SYSTEMS

		Services(1)				Facility Types (2)				Product Made(3)				Major Mat (4)				Production Capacity (5) in 1000's of sq. ft.				Elements Provided (6)			
1	2	3	4	1	2	3	4	5	6	7	1	2	3	4	1	2	3	4	1	2	3	4			
Adrian Housing Corp.																									
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	24	unh.	unh.	24	unh.	X	X	X			
Airflow Metal Products																									
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	10	0	2.5	5	10	X	X	X			
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	350	X	X	X	X	X	X	X			
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	112	X	X	X	X	X	X	X			
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	17600	X	X	X	X	X	X	X			
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	120	X	X	X	X	X	X	X			
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	150	X	X	X	X	X	X	X			
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	100	X	X	X	X	X	X	X			
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0	X	X	X	X	X	X	X			
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	240	X	X	X	X	X	X	X			
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	20	X	X	X	X	X	X	X			
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	150	X	X	X	X	X	X	X			
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	unh.	X	X	X	X	X	X	X			

PRODUCT/SYSTEM CAPABILITIES MATRIX																							
		Systems Types (2)				Systems Elements (3)				Production Capacity (4)				Production Rate									
1	2	3	4	1	2	3	4	5	6	7	8	9	1	2	3	4	5						
X	X	X	X	X	X	X	X	X	X	X	X	X	1040	unh.	1040	2000	2000	In 1000's of Pounds					
X	X	X	X	X	X	X	X	X	X	X	X	X	200	unh.	1.5	400	400	In 1000's of units					
X	X	X	X	X	X	X	X	X	X	X	X	X	12	unh.	unh.	unh.	unh.	In 1000 units of 12gears					
X	X	X	X	X	X	X	X	X	X	X	X	X	25	unh.	unh.	34	34	Quarterer Rate					
X	X	X	X	X	X	X	X	X	X	X	X	X	7	---	unh	provided	---	Balls					

Capacity in Monthly
 on hand
 available from inventory
 available w/in 60 days
 in Monthly Output
 provided (Structure, Basis, etc., Floor are Assumed)
 or Partitions
 g, Ventilating and Air Conditioning
 ical Distribution
 ing
 ing

PRODUCT/SYSTEM CAPABILITIES MATRIX

UTILITY SYSTEMS

	Services (1)				System Types (2)				System Elements (3)				Production Capacity (4)				Production Rates			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Advanced Drilling Systems, Inc.	X	X	X	X	X	X	X	X	X	X	X	X	1000	unh.	1000	2000	In 1000's of Pounds	In 1000's of units	In 1000 units of lights	Generator Sets
AIWAC	X	X	X	X	X	X	X	X	X	X	X	X	200	unh.	1.5	400	400	unh.	unh.	unh.
Allison Brothers, Inc.	X	X	X	X	X	X	X	X	X	X	X	X	12	unh.	unh.	unh.	unh.	unh.	unh.	unh.
Begon Electric Mfg. Co.	X	X	X	X	X	X	X	X	X	X	X	X	25	unh.	unh.	34	34	unh.	unh.	unh.
Chromalox Corp.	X	X	X	X	X	X	X	X	X	X	X	X	7	unh.	unh.	unh.	unh.	unh.	unh.	unh.
Electrical Contractors, Inc.	X	X	X	X	X	X	X	X	X	X	X	X	15	unh.	unh.	unh.	unh.	unh.	unh.	unh.
Empire Generator Corp.	X	X	X	X	X	X	X	X	X	X	X	X	25	unh.	unh.	unh.	unh.	unh.	unh.	unh.
Exxon Thermoplastics, Inc.	X	X	X	X	X	X	X	X	X	X	X	X	25	unh.	unh.	unh.	unh.	unh.	unh.	unh.
General Dynamics Corp., Formosa Div.	X	X	X	X	X	X	X	X	X	X	X	X	25	unh.	unh.	unh.	unh.	unh.	unh.	unh.
ILI Corp., Engine Generator Systems	X	X	X	X	X	X	X	X	X	X	X	X	25	unh.	unh.	unh.	unh.	unh.	unh.	unh.
John-Humille, Pipe Div.	X	X	X	X	X	X	X	X	X	X	X	X	25	unh.	unh.	unh.	unh.	unh.	unh.	unh.
Kastlight Corp.	X	X	X	X	X	X	X	X	X	X	X	X	25	unh.	unh.	unh.	unh.	unh.	unh.	unh.
Kohler Corp.	X	X	X	X	X	X	X	X	X	X	X	X	25	unh.	unh.	unh.	unh.	unh.	unh.	unh.
McCoy Corp.	X	X	X	X	X	X	X	X	X	X	X	X	25	unh.	unh.	unh.	unh.	unh.	unh.	unh.
Metallurgical Corp.	X	X	X	X	X	X	X	X	X	X	X	X	25	unh.	unh.	unh.	unh.	unh.	unh.	unh.
Wagoner Corp.	X	X	X	X	X	X	X	X	X	X	X	X	25	unh.	unh.	unh.	unh.	unh.	unh.	unh.

(1) Services
 1. Design of System
 2. General Contracting
 3. Site Erection
 4. Sales to Erector

(2) System Types
 1. Site Electrical
 2. Piping
 3. Water Storage and Treatment
 4. Sanitary Sewage Treatment

(3) System Elements
 1. Temporary Electrical Generation
 2. Exterior Lighting
 3. Site Electrical Distribution
 4. Gas Pipe
 5. Water Pipe
 6. Water Storage
 7. Water Treatment
 8. Sewer Pipe
 9. Sewage Treatment

(4) Production Capacity
 1. Average Monthly
 2. Inventory on hand
 3. Deliverable from inventory
 4. Deliverable w/in 60 days
 5. Maximum Monthly Output

(5) Production Rates
 1. In 1000's of Pounds
 2. In 1000's of units
 3. In 1000 units of lights
 4. Generator Sets
 5. Units

Figure 4. Suggested capabilities matrices.

Tabular Format Example: ISB

1 ACME MODULAR SYSTEMS
1234 Main Street
Anytown, TN 12345
(123) 456-7890

4 Alt: John Doe/Owner
J. D. Modular Sales
1111 Fort Able Road
Fortown, GA 13456
(234) 678-9012

5 Plant: Acme Modular Systems
123 Industry Drive
P.O. Box 4567
Nextown, GA 13454
(234) 567-8901

Services Provided—System Design	Site Erection
General Contracting	Sales to Erector

Modular Mode—Modular, wood frame, 3-dimensional stackable (to 3 high) unit of incremental length and standard width.

Applicable Category Codes: Housing--721, 724 Ops, Training, Admin--
Dining--722 141, 171, 610, 723
Latrine/Shower--723 Medical--540, 55C

Maximum Economic Shipping Distance--250 miles

Average Monthly Production	--	70,000 SF
Completed Product/System in Stock	--	10,000 SF
Producible from Stock Materials	--	130,000 SF
Deliverable Within Sixty (60) Days	--	140,000 SF
Maximum Monthly Output	--	100,000 SF

Standard Sizes:	12 x 20	12 x 40	12 x 60
	12 x 30	12 x 50	12 x 70

System Elements Provided:	Structure	Floor	Interior Partitions
	Exterior Walls	Ceiling	Elec. Distribution
	Roof	HVAC	Lighting
			Plumbing

1. Data always pertain to the manufacturer's headquarters office, even if that office might be outside the identified search area.
2. Identified procurement contact could be at either the company headquarters or at the closest plant, depending on the company's sales policies.
3. Identified technical contact could be at either the company headquarters or at the closest plant.
4. Data pertain to the local distributor of the product/system or, in larger companies, a regional sales contact.
5. Data always pertain to the manufacturing plant (source of supply) which would provide product to the identified installation.

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Option 2: District Preparation of Data in Catalog Form

Overview

In addition to the source and basic capabilities information on manufactured building systems used in Option 1, the compilation of detailed system data and procurement guidance in a district-prepared catalog represents a second fielding option. Whether patterned after the prototype Expedient Facilities Catalog or designed to individual district requirements, a catalog would represent a more complete and usable document to support mobilization facilities acquisition. This option, however, would require a higher outlay of time and funding both for initial preparation and yearly revision. The suggested order of data for the district-prepared catalog is shown in Figure 5.

The steps involved in the Option 2 activity of having the district prepare data in catalog form are listed below and then described in greater detail.

Data Collection

1. Define Area of Search
2. Select Manufacturer Source Information
- 2a. Advertise for Interested Manufacturers
3. Obtain Manufacturer POC Information
4. Verify Manufacturer Applicability
5. Administer Questionnaire
- 5a. Request Product Literature

Data Presentation

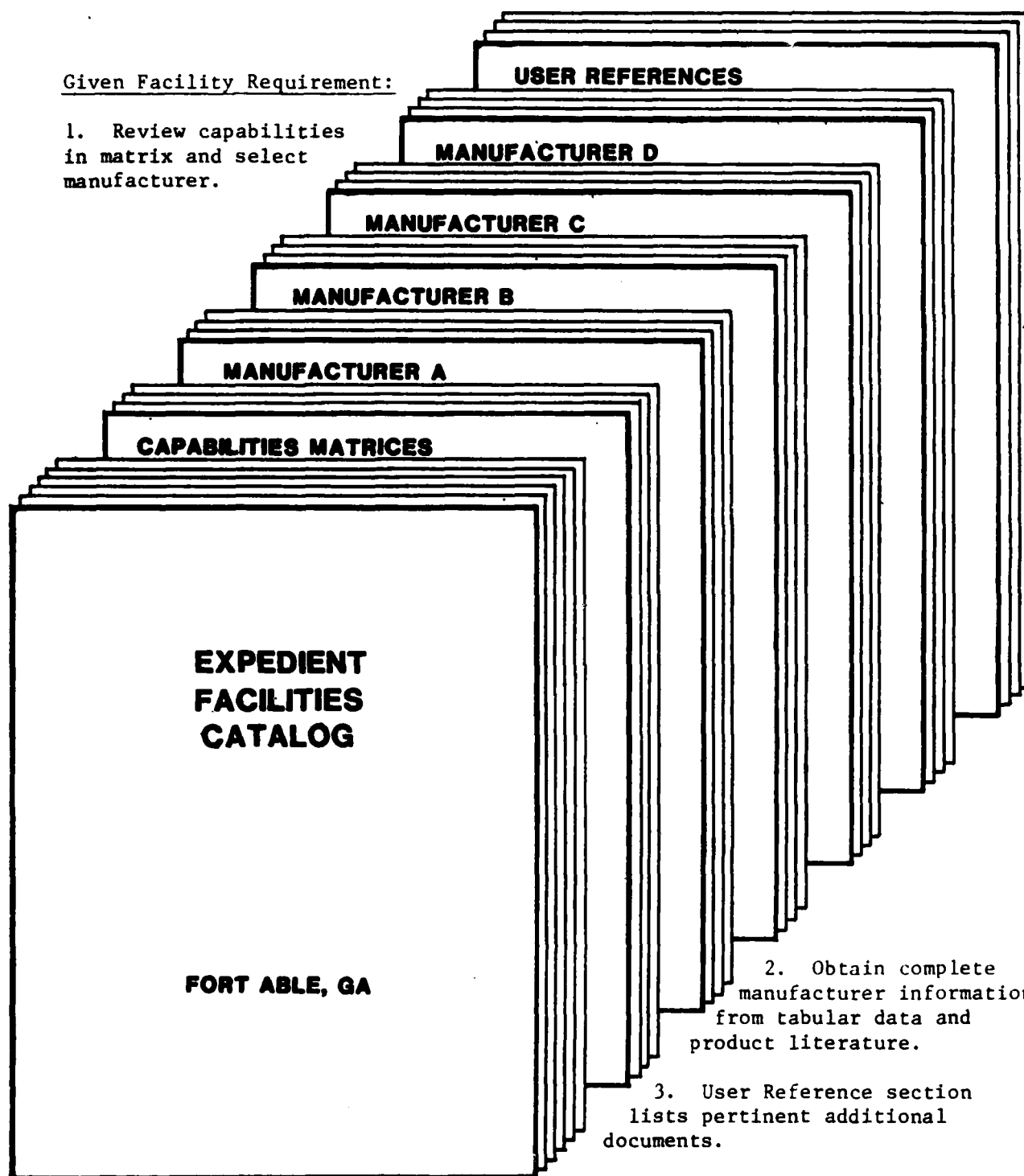
1. Prepare Catalog General Introduction/Contents
2. Prepare Capabilities Matrix
3. Prepare Manufacturer/Product Tabular Data
4. Prepare Manufacturer/Product Literature
5. Prepare User References

Data Collection

1. Define Area of Search (see Option 1, Data Collection, Step 1).
2. Select Manufacturers Source Information (see Option 1, Data Collection, Step 2).
 - 2a. Advertise for Interested Manufacturers (see Option 1, Data Collection, Step 2a).
3. Obtain Manufacturer POC Information (see Option 1, Data Collection, Step 3).
4. Verify Manufacturer Applicability (see Option 1, Data Collection, Step 4).

Given Facility Requirement:

1. Review capabilities
in matrix and select
manufacturer.



2. Obtain complete
manufacturer information
from tabular data and
product literature.

3. User Reference section
lists pertinent additional
documents.

Figure 5. Data sequence: district-prepared catalog.

5. Administer Questionnaire (see Option 1, Step 5). More extensive data on systems may be displayed on manufactured building systems in catalog format than may be in the ISB. In addition to that information suggested in Option 1 (Table 5), information identified in Table 6 and Appendix B should be obtained by direct mail survey. Table 6 indicates both suggested data on systems capabilities subdivided as to elements of the total system, and optional data on materials of systems elements.

5a. Request for Product Literature. Product literature or catalogs are required for adequate graphic display of product capabilities.

Data Presentation

1. Prepare Catalog General Introduction/Contents. A brief introduction should be prepared for the catalog listing its contents and providing user guidance on its use either derived from this report or locally developed for any modification made.

2. Prepare Capabilities Matrix (see Option 1, Data Presentation, Step 1).

3. Prepare Manufacturer/Product Tabular Data. Manufacturer data obtained through the questionnaire and from product literature should be compiled as indicated in Table 10. As a minimum, data concerning overall systems capabilities and configurations should be tabulated; however, more specific data on materials may also be listed (See Table 6 and Appendix B). Data should be compiled by manufacturer and product and entered in the catalog in alphabetical order by manufacturer.

4. Prepare Manufacturer/Product Literature. Product literature of catalogs provided by the manufacturer will be too voluminous for incorporation in an installation expedient facility catalog. If a single-volume catalog is desired, the provided literature should be reviewed and material representative of product capabilities selected for catalog inclusion. Remaining data may be filed separately.

5. Prepare User References. User references have been provided in Appendix C; however, these may be expanded/modified to meet installation requirements. As a minimum, the current ISB and Mobilization Master Plans should be made additional references.

Option 3: Centralized Preparation of Data in Catalog Form

Overview

The last fielding option is the preparation of an Expedient Facilities Catalog by a single assigned Corps of Engineers organization. This option would entail the same processes as District preparation with minor modifications. Central preparation and dissemination of data could achieve cost savings. However, any catalog prepared would be required to be of uniform format and content and therefore could not be tailored to individual district requirements. Because of the need for user flexibility in development and application of the catalog, this option is placed last in priority. The

Table 10

Tabular Format Example: Catalogs

Manufacturer Profile

¹ ACME MODULAR SYSTEMS
1234 Main Street
Anytown, TN 12345
(123) 456-7890

² Proc: John Smith/V-P, Sales/SAL*
(123) 456-7899

³ Tech: Bill Jones/Engineer/SAL*
(123) 456-7890

⁴ Alt: John Doe/Owner
J. D. Modular Sales
1111 Fort Able Road
Porttown, GA 13456
(234) 678-9012

⁵ Plant: Acme Modular Systems
123 Industry Drive
P.O. Box 4567
Nexttown, GA 13454
(234) 567-8901

(SAL = Same as left)

Method(s) of Procurement--Direct to Government (possible)
Through Distributor/Dealer (preferred)

Services Provided--System Design Site Erection
General Contracting Sales to Erector

Product/System Profile

Modular Mode--Modular, wood frame, 3-dimensional stackable (to 3 high)
unit of incremental length and standard width.

Prefabrication Mode--3-Dimensional Module

Applicable Category Codes: Housing--721, 724 Ops, Training, Admin--
Dining--722 141, 171, 610, 723
Latrine/Shower--723 Medical--540, 550

Code Compliance--BOCA Building Code
FHA Standards
Southern Building Code
Uniform Building Code
Others as required

Cost/Sq Ft of Enclosed Floor--\$30.00

Maximum Economic Shipping Distance--250 miles

Production Capacity

Average Monthly Production	--	70,000 SF
Completed Product/System in Stock	--	10,000 SF
Producible from Stock Materials	--	130,000 SF
Deliverable Within Sixty (60) Days	--	140,000 SF
Maximum Monthly Output	--	100,000 SF

Standard Sizes:	12 x 20	12 x 40	12 x 60
	12 x 30	12 x 50	12 x 70

Table 10 (Cont'd)

Product/System Data

System Elements Provided:	Product/System Data		
	Structure Exterior Walls Roof	Floor Ceiling HVAC	Interior Partitions Elec. Distribution Lighting Plumbing
Foundation	-- Piers or Perimeter Walls		
Structure	-- Bearing Walls, Wood		
Exterior Walls	-- Load Bearing		
Windows	-- Single Hung		
Doors	-- Hollow Core Personnel, Single Leaf		
Roof	-- Flat/Minimal Slope, Trussed		
Floor	-- Joist/Deck		
Ceiling	-- Applied directly to Structure		
Interior Partitions	-- Nonload Bearing		
HVAC	-- Forced-air Furnace		
Electrical Distribution	-- Integrated with Interior/Exterior Walls		
	-- Integrated with Floor/Ceiling		
Lighting	-- Surface Mounted Point Source Incandescent		
Plumbing	-- Prefabricated Wet Module(s), Bath, Mechanical		
System Elements Excluded	-- Foundations		

Note:

1. Data always pertain to the manufacturer's headquarters office, even if that office might be outside the identified search area.
2. Identified procurement contact could be at either the company headquarters or at the closest plant, depending on the company's sales policies.
3. Identified technical contact could be at either the company headquarters or at the closest plant.
4. Data pertain to the local distributor of the product/system or, in larger companies, a regional sales contact.
5. Data always pertain to the manufacturing plant (source of supply) which would provide product to the identified installation.

*Same address as main office.

suggested order of data for an Expedient Facilities Catalog by a single installation is presented in Figure 6.

A natural extension of this option would be the preparation of an automated system to store information on expedient facilities. The creation of a central data base available for inquiry on a remote/interactive basis could be designed to meet most District requirements and could be easily updated. However, an automated system would require the highest initial fund outlay.

The steps involved in the Option 3 activity of the centralized preparation of data in catalog form are listed below and then described in greater detail.

Data Collection

1. Define Area of Search
2. Select Manufacturer Source Information
- 2a. Advertise for Interested Manufacturers
3. Obtain POC Information
4. Verify Manufacturer Applicability
5. Administer Questionnaire
- 5a. Request Product Brochures

Data Presentation

1. Prepare Catalog General Introduction/Contents
2. Prepare Capability Matrix
3. Prepare Manufacturer/Product Tabular Data
4. Prepare Manufacturer/Product Literature
5. Prepare User References

Data Collection

Data Collection Steps 1 to 4 are identical to those in Options 1 and 2.

5. Administer Questionnaire. This data collection step of Option 3 is identical to Options 1 and 2 except that optional information on materials should be provided as listed in Table 6 and Appendix B.

5a. Request Product Brochures (see Option 2, Data Collection, Step 5a).

Data Presentation

1. Prepare Catalog General Introduction/Contents (see Option 2, Data Presentation, Step 1).

2. Prepare Capabilities Matrix (see Option 2, Data Presentation, Step 2).

3. Prepare Manufacturer/Product Tabular Data (see Option 2, Data Presentation, Step 3).

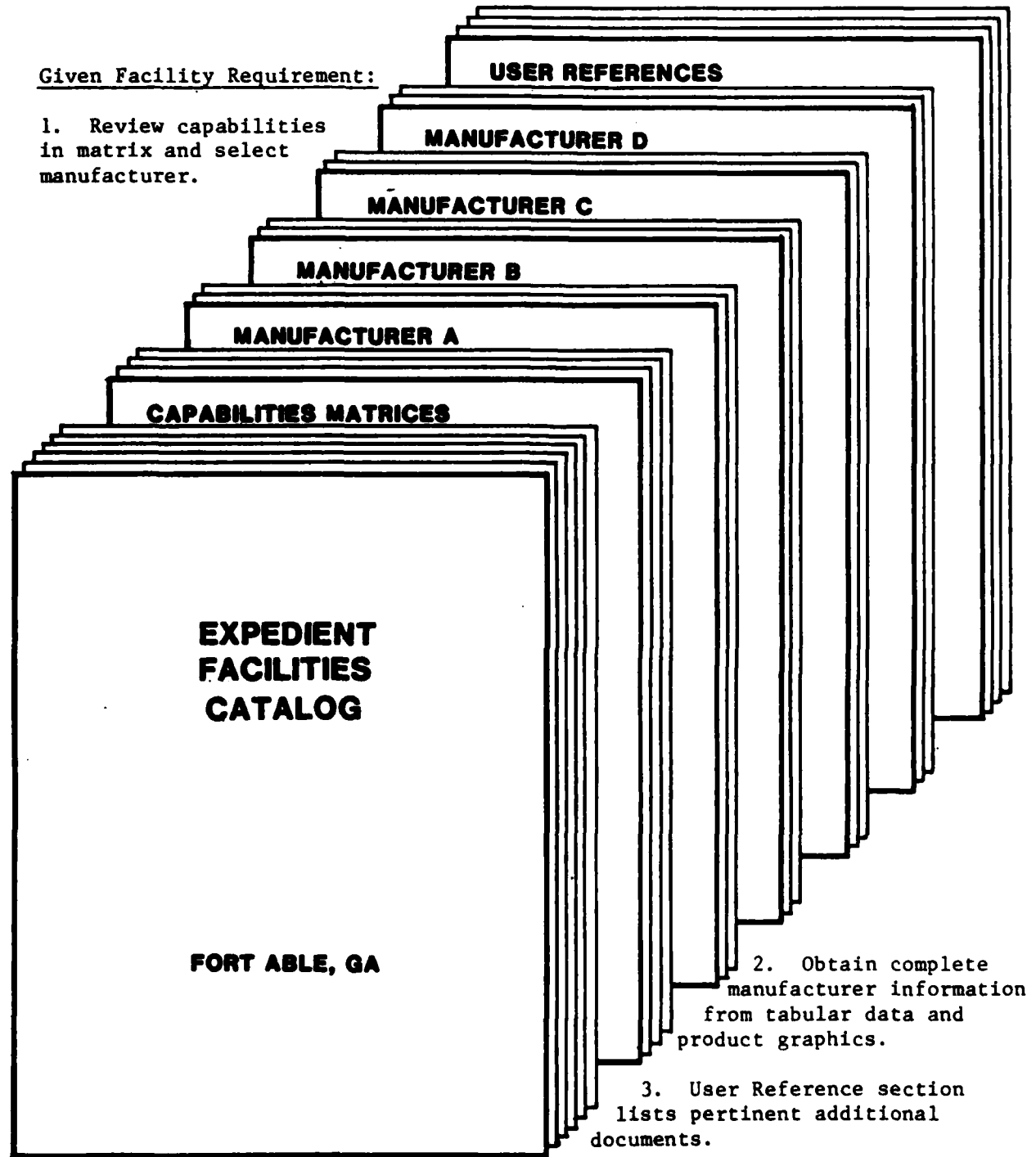


Figure 6. Data sequence: centrally prepared catalog.

4. Prepare Manufacturer/Product Literature. A single sheet of simple line drawings should be prepared for each product of a single manufacturer derived from their product literature. This graphic representation should generically define the characteristics and capabilities of the product/systems in an easily reproducible form (see Figure 7).

5. Prepare User References. A bibliography of literature on mobilization facilities planning is provided as Appendix C. Publications which should be included in a list of user references are marked with an asterisk. These references should be provided as an appendix to a published catalog.

Figure 8 displays attributes of manufactured building systems data presented by the various options proposed.

1.0	<u>Manufacturer Profile</u>	
1.1	Name, Address, Phone	
1.2	Product Name(s)/Description(s)	
1.3	Points of Contact	
1.4	Methods of Procurement	1
1.5	Services Provided	
2.0	<u>Product/System Profile</u>	
2.1	Prefabrication Configuration	
2.2	Applicable Category Codes	
2.3	Code Compliance	
2.4	Cost per Square Foot (enclosed floor)	
2.5	Maximum Economic Shipping Distance	
3.0	<u>Production Capacity</u>	
3.6	Standard Size(s) / Construction Module	1
4.0	<u>Product/System Data</u>	
4.1	System Elements Provided	
4.2	Foundation Type(s)	
4.3	Structure	2
4.3.1	Basic Configuration	
4.3.2	Materials	
4.4	Exterior Walls	
4.4.1	Basic Configuration	
4.4.2	Exterior Finish	
4.4.3	Subsurface	
4.4.4	Core	
4.4.5	Interior Finish	
4.5	Windows	2
4.5.1	Basic Configuration	
4.5.2	Materials	
4.6	Doors	2
4.6.1	Basic Configuration	
4.6.2	Materials	
4.6.3	Frame Materials	
4.7	Roof	2
4.7.1	Basic Configuration	
4.7.2	Exterior Surface	
4.7.3	Subsurface	
4.8	Floor	2
4.8.1	Basic Configuration	
4.8.2	Finish Surface	
4.9	Ceiling	2
4.9.1	Basic Configuration	
4.9.2	Materials/Finish	
4.10	Interior Partitions	2
4.10.1	Basic Configuration	
4.10.2	Finish	
4.10.3	Subsurface	
4.10.4	Core	
4.11	HVAC	2
4.11.1	Basic Configuration	
4.11.2	Location	
4.11.3	Control	
4.11.4	Energy Source	
4.12	Electrical Distribution	
4.13	Lighting	2
4.14	Plumbing	
4.14.1	Basic Configuration	
4.14.2	Waste/Vent Pipe Materials	
4.14.3	Water Distribution Materials	
4.14.4	Gas Pipe Materials	
4.14.5	Fixture(s) Materials	
5.0	Interface Criteria	2
5.1	System Elements Excluded	
5.2	Excluded Elements - Details	
5.3	Interface(s) - Details	

See also: Appendix A,
Tabulated Data Format -
Possible Responses.

NOTE: Bold-faced numbers
refer to the first appli-
cable Option for each
data entry.

3

Figure 8. Product attribute list by option.

4 CONCLUSIONS AND RECOMMENDATIONS

An Expedient Facilities Catalog was originally proposed as a means to identify and disseminate information on available alternative mobilization construction resources. This information was to be used (1) during the preparation of standard Army mobilization drawings (M-drawings), technical manuals, and construction drawings, and (2) as an alternative to conventional procurement practices. Results of investigations during catalog preparation have confirmed the need for alternatives to conventional/planned mobilization facilities procurement procedures. However, future activities with regard to the acquisition and dissemination of information on off-the-shelf products/systems for use in mobilization must be conducted within the constraints of limited funding. Consideration must also be given to growing national trends toward automation.

Data that identify possible manufacturers of expedient facilities should be incorporated in Installation Support Books within the Installation Environment section.

APPENDIX A:

POLYURETHANE FOAM DOAM SHELTER CONSTRUCTION

Rapidly erectable polyurethane foam shelters can be used to augment both conventional and off-the-shelf procurement of emergency building facilities. Current technology exists for the rapid erection of expedient dome shelters using low levels of labor and off-the-shelf polyurethane spray foam systems.

The foam components are commercially available in large quantities, are stable, and are dense in the shipping and storage condition (liquids). Upon need of expedient facilities, the liquid components are easily and rapidly mixed and applied using simple foaming equipment.

Formwork may be as simple as an inflatable form which occupies little space in shipment or storage. Reusable forms are of lightweight films which may be placed at the site and relocated as required with minimal effort. A low-volume, low-pressure blower unit is sufficient to provide form inflation. More elaborate forms may be used if many shelters of the same type and size are required.

Site preparation is minimal and as the shelters are lightweight, extensive foundation work is eliminated. If a floor is required, a concrete slab may be poured prior to erection and the building placed over it, or the building may be erected and then a slab poured. Depending on intended use, a prepared gravel surface may be acceptable. As the dome shelters are lightweight, anchorage must be provided, whether by ropes and anchors or earth backfill.

Labor intensity and skill levels required for foam building erection are low. A two- to three-person team has proved sufficient, with crew size and erection time varying with dome size and erection techniques. Labor skills associated with paint spraying are easily augmented to accommodate foam spraying.

The dome is painted to provide durability and camouflage. Fire resistivity is added by the application of cementite coatings. Additional durability can be achieved by applying fiber-reinforced shotcrete to the exterior.

Dome diameters of up to 100 ft providing a floor area of 7854 sq ft, are possible; however, small to intermediate size domes are more practical. CERL has demonstrated the erection of domes using various forming techniques, with the basic characteristics presented in Table A1.

Additional information on foam dome technology may be found in the following CERL technical reports:

G. R. Williamson, A. Smith, D. Morse, M. Woratzuk, and H. Burret, Inflation/Foam/Shotcrete System for Rapid Shelter Construction, Technical Report M-215/ADA040789 (CERL, May 1972).

A. Smith, Dome Shelter Construction with Polyurethane Foam, Technical Report M-225/ADA044992 (CERL, August 1977).

or by contacting:

Alvin Smith
U.S. Army Construction Engineering Research Laboratory
P.O. Box 4005
Champaign, IL 61820

Commercial Phone: (217) 373-7245
FTS Phone 958-7245, or
AUTOVON through Chanute AFB.

Table A1

Foam Dome Information

	<u>15 ft dome</u>	<u>18 ft dome</u>	<u>28 ft dome</u>
Thickness, in.	1.5, 3.5, 5	4	6-8
Floor Area, sq. ft.	176	254	615
Time to form, hrs.	0.6, 0.9, 1.3	1.5	10
Personnel Required	2	3	3

Note: Forming time does not include set up time and does not reflect a reduction in erection time which would follow with repetition.

APPENDIX B:

TABULATED DATA FORMAT--POSSIBLE RESPONSES

1.0 Manufacturer Profile

1.1 Name/Address: (Always Parent Firm or Prime Address)

(name)
(mailing address)
(street address)
(city, state, zip code)
(phone number)

1.2 Product Name(s)

A - (name)
B - (name)
C - (etc.)

1.3 Point of Contact

(name, title, office, phone no.,
and address if other than above)

Procurement:
Technical:
Alternate/Local:
Manufacturing Source:

1.4 Methods of Procurement

Direct to Government
Through Distributor/Dealer
Through General/Prime Contractor

1.5 Services Provided

System Design
General Contracting
Site Erection
Sales to Erector

.2.0 Product/System Profile

.2.1 Prefabrication Mode

3-Dimensional Module
Panelized
Precut

(All paragraphs, .2.0 thru .5.3 will be
assigned a letter prefix corresponding with
the product(s) listed in para 1.2.
Data listed will address each applicable
product.)

_.2.2 Applicable Category Codes, General/Specific

Housing

721 15 Enlisted Barracks, Mobilization
724 10 Unaccompanied Officers Quarters, Military

Dining

722 10 Enlisted Personnel Dining Facility
722 20 Officers Field Ration Dining Facility

Latrine/Shower

723 24 Detached Latrine/Shower Building

Operational, Training, and Administration

141 82 Regimental/Brigade Headquarters Building
141 83 Battalion Headquarters Building
171 50 Battalion Classroom
171 51 Battalion Administration and Classroom
610 12 Division Headquarters Building
723 30 Administration and Supply

Vehicle Maintenance, Warehouse, and Storehouse

442 20 General Purpose Warehouse
442 70 General Storehouse

Medical

540 10 Dental Clinic
550 10 Clinic Without Beds

Utilities

811 90 Temporary Electrical Generators
812 30 Exterior Lighting
812 40 Distribution Systems-Electrical
824 10 Gas Pipe Line
832 10 Sanitary Sewer
841 21 Ground Storage Tank-Water
842 10 Water Pipe Line, Potable

_.2.3 Code Compliance

Building Officials and Code Administrators International--BOCA
Building Code
Department of Defense Construction Criteria Manual DOD 4270.1-M
National Building Code
Federal Housing Administrator--FHA Standards
National Electric Code
National Fire Protection Association--NFPA Codes
National Plumbing Code
Southern Building Code
Underwriters Laboratories--UL Codes
Uniform Building Code
(Other identified by title)

- _.3.0 Production Capacity
- | | | |
|------------------------------------|-----|----|
| Average Monthly Production | (#) | SF |
| Completed Product/System in Stock | (#) | SF |
| Producible from Stock Materials | (#) | SF |
| Deliverable Within Sixty (60) Days | (#) | SF |
| Maximum Monthly Output | (#) | SF |
- _.4.0 Product/System Data
- _.4.1 Basic System Elements Provided
- Foundation
Structure
Exterior Walls
Roof
Floor
Ceiling
Interior Partitions
Heating/Ventilating/Air-Conditioning
Electrical Distribution
Lighting
Plumbing
Other identified by short title/descriptor
- _.4.2 Foundations
- Slab
Piers
Caissons/Piles
Perimeter Walls
Grade Beams
Spread Footings
Other identified by short title/descriptor
- _.4.3 Structure
- _.4.3.1 Basic Configuration
- Skeletal Frame
Bearing Wall
Other identified by short title/descriptor
- _.4.3.2 Materials
- Metal, type specified by name(s)
Wood
Concrete
Other identified by short title/descriptor

.4.4 Exterior Walls

.4.4.1 Basic Configuration

Load Bearing

Curtain Wall

Other identified by short title/descriptor

.4.4.2 Exterior Finish

Paint/Stain

Baked Enamel

Vinyl

Wood

Hardboard

Plywood

Aluminum

Galvanized Metal

Fiberglass

Concrete

Stucco

Other identified by short title/descriptor

.4.4.3 Subsurface

Wood

Plywood

Hardboard

Metal, type specified by name(s)

Fiberglass

Sheathing

Concrete

Other identified by short title/descriptor

.4.4.4 Core

Wood

Metal, type specified by name(s)

Fiberglass

Concrete

Masonry

Other identified by short title/descriptor

.4.4.5 Interior Finish--See Interior Partitions, Finish

.4.5 Windows

.4.5.1 Basic Configuration

Fixed
Casement
Single/Double Hung
Sliding
Awning
Coffer
Other identified by short title/descriptor

.4.5.2 Materials

Wood
Clad Wood
Aluminum
Steel
Plastic
Other identified by short title/descriptor

.4.6 Doors

.4.6.1 Basic Configuration

Hollow Core
Solid Core
Personnel, Single/Double Leaf
Fire Door Class B
Fire Door Class C
Overhead Door
Other identified by short title/descriptor

.4.6.2 Materials

Metal, type specified by name(s)
Wood

.4.6.3 Frame Materials

Metal, type specified by name(s)
Wood

.4.7 Roof

.4.7.1 Basic Configuration

Gabled
Flat/Minimal Slope
Truss
Joist
Beam and Purlin
Other identified by short title/descriptor

.4.7.2

.4.7.3

.4.8

.4.8.1

.4.8.2

.4.9

.4.9.1

_.4.9.2 Materials/Finish

Acoustical Board
Gypsum Board
Particle Board
Hardboard
Plywood
Concrete
Aluminum
Paint
Baked Enamel
Vinyl
Other identified by short title/descriptor

_.4.10 Interior Partitions

_.4.10.1 Basic Configuration

Load Bearing
Nonload Bearing
Fire Rated
Operable/Folding
Integrated With Ceiling System

_.4.10.2 Finish

Paint/Stain
Baked Enamel
Wall Paper
Vinyl Wall Covering
Plastic Laminate
Wood
Plywood Paneling
Hardboard Paneling
Chalkboard/Tackboard
Concrete
Ceramic Tile
Aluminum
Other identified by short title/descriptor

_.4.10.3 Subsurface

Wood
Plywood
Hardboard
Metal, type specified by name(s)
Gypsum
Gypsum Board
Concrete
Other identified by short title/descriptor

Core

Metal, type specified by name(s)

Concrete

Other identified by short title/descriptor

Heating,, Ventilating and Air-Conditioning

Basic Configuration

Heat Pump, Central/Incremental

Central Boiler/Chiller & Unit Ventilators

Direct Fired Unit Heaters

Infrared Radiant Heaters

Other identified by short title/descriptor

Location

Roof top

Attic/Crawl Space

Other identified by short title/descriptor

Control

Multizone

Energy Source

Fuel Oil

Coal/Wood

Electrical Distribution

Integrated with Floor/Ceiling

Three Phase

TABLE 1. *Continued*

_.4.13 Lighting

Flat Panel Fluorescent-Ceiling Integrated
Point Source Incandescent-Wall/Ceiling Mounted
Suspended Fluorescent/Incandescent
Metal Halide
Mercury Vapor
Sodium, High/Low Pressure, HP/LP

_.4.14 Plumbing

_.4.14.1 Basic Configuration

Prefabricated Plumbing Wall
Prefabricated Wet Module, Bath, Mechanical
Integrated With Interior/Exterior Walls
Integrated With Floor/Ceiling System

_.4.14.2 Materials, Waste/Vent Pipe

Plastic, PVC
Plastic, ABS
Cast Iron
Galvanized Steel
Copper
Other identified by short title/descriptor

_.4.14.3 Materials, Water Distribution

Plastic
Copper
Galvanized Steel
Brass
Ductile Iron
Other identified by short title/descriptor

_.4.14.4 Materials, Gas Pipe

Steel
Galvanized Steel
Ductile Iron
Copper
Brass
Other identified by short title/descriptor

_.4.14.5 Materials, Fixtures

Porcelain--Lavatory, Water Closet, Shower, Urinal
Fiberglass--Lavatory, Water Closet, Shower, Urinal
Plastic--Lavatory, Water Closet, Shower, Urinal
Concrete--Lavatory, Water Closet, Shower, Urinal
Metal--Lavatory, Water Closet, Shower, Urinal
Ceramic Tile--Lavatory, Water Closet, Shower, Urinal

.5. Product/System Included/Excluded Interface

.5.1 Basic Systems Elements Excluded

Foundation
Ceiling
Interior Partitions
Heating, Ventilating, and Air-Conditioning
Electrical Distribution
Lighting
Plumbing

.5.2 Excluded Elements--Details (Data will be included in this paragraph, in the same format as above, for each excluded element.)

.5.3 Interface--Details (A brief verbal account of special interface requirements.)

APPENDIX C:

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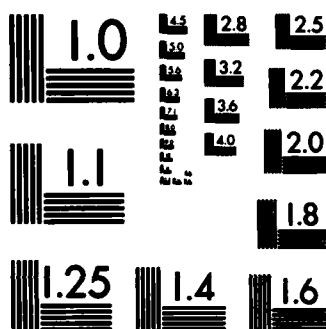
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